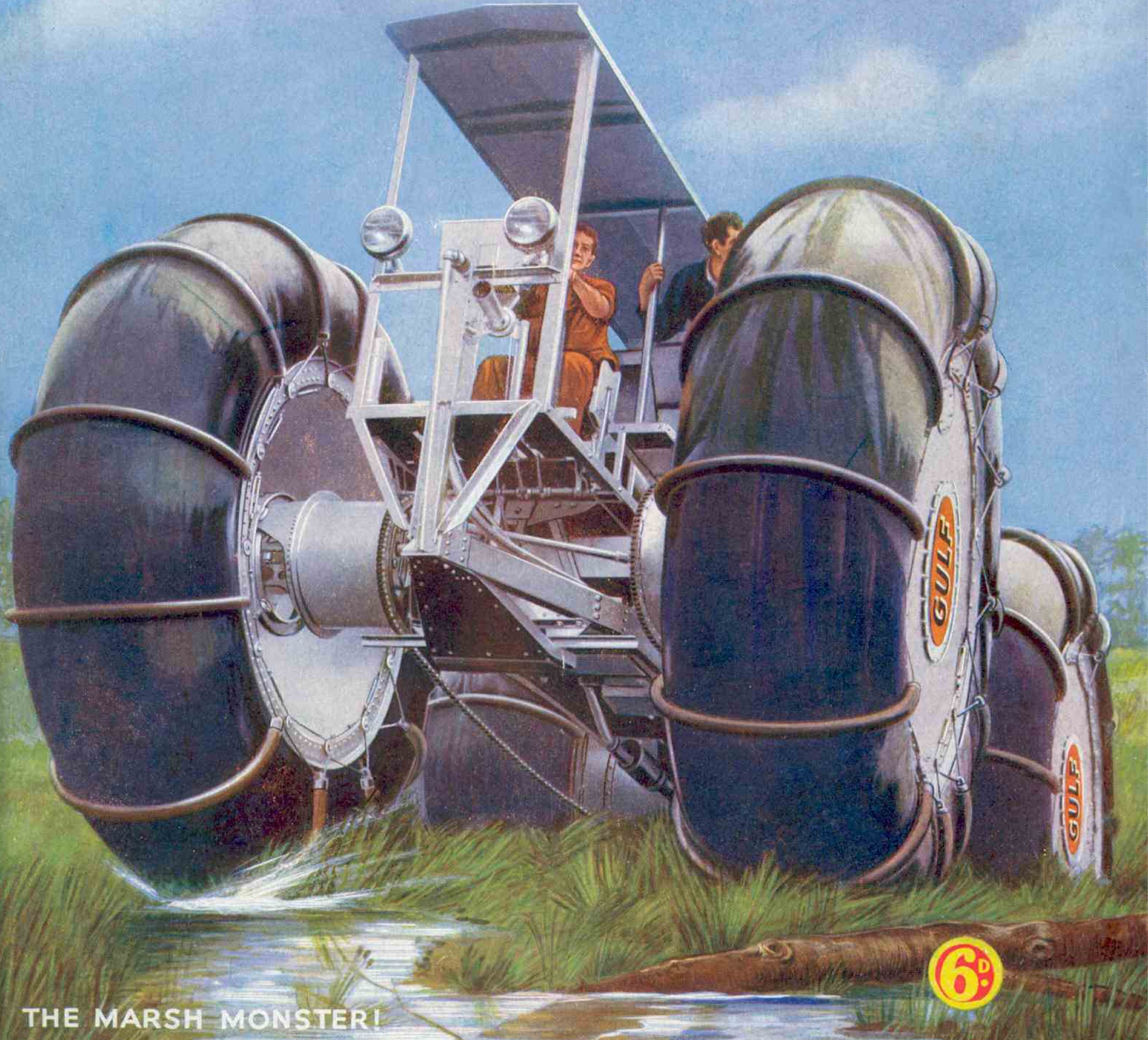
VOL. XXIII. No. 2

FEBRUARY 1938

MECCANO MAGAZINE

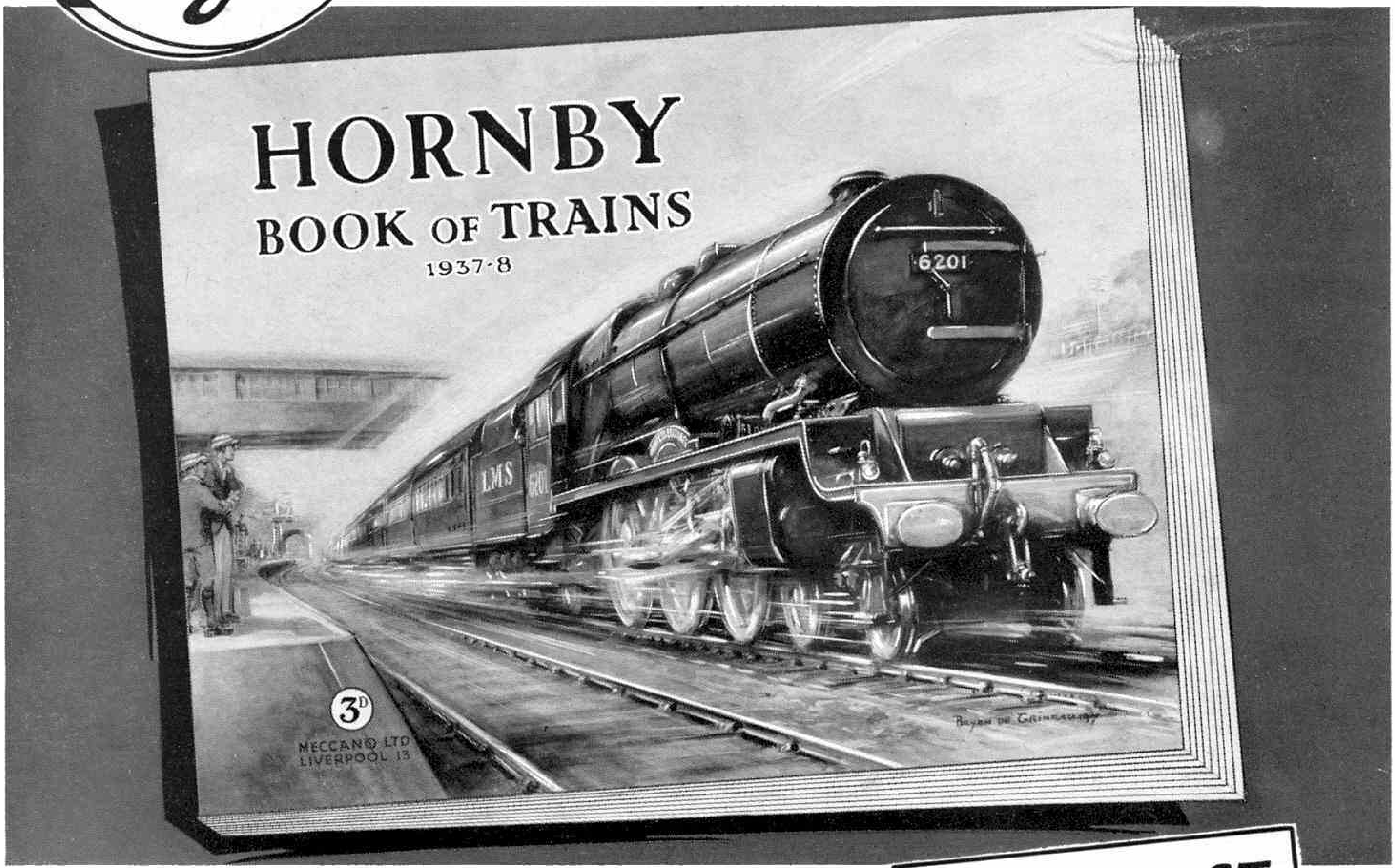


6d.

THE MARSH MONSTER!

Look Boys!

The 1937-8 HORNBY BOOK of TRAINS



THE FINEST RAILWAY BOOK OF THE YEAR

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Of absorbing interest to Railway enthusiasts

The 1937-8 issue of the Hornby Book of Trains is the finest that has ever been produced. It contains splendid articles, fully illustrated by photographs, dealing with British express trains and locomotives, the mysteries of an engine shed, the fascination of operating a miniature railway, and other interesting topics.

In addition the book forms a complete catalogue of Hornby Trains for electric and clockwork railways. The Hornby Locomotives, Rolling Stock and Accessories are beautifully illustrated in full colour.

How to obtain the Book

The Hornby Book of Trains may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Liverpool 13, price 4½d. post free. In the latter case a remittance in stamps should be sent and the name and address of the sender should be clearly written.

Readers living in Australia, New Zealand or South Africa who require copies should send their postal orders for 8d. (which includes postage) to the addresses given below. The Meccano Branch at Toronto will deal with Canadian orders and the price is 12 cents postpaid.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Liverpool 13, sending 6d. in stamps with their order.

Overseas Agencies:

AUSTRALIA: E. G. Page & Co., 52, Clarence St., Sydney (P.O. Box 1832k).
NEW ZEALAND: Models Limited, Fayke's Buildings, Anzac Avenue, Auckland C.1 (P.O. Box 129).
SOUTH AFRICA: Arthur E. Harris, 142, Market Street, Johannesburg (P.O. Box 1199).
CANADA: Meccano Ltd., 187-189, Church Street, Toronto.

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No. 29 *February, 1938*

A FINE FRETWORK SET

GREAT NEWS FOR YOUNG CRAFTSMEN

Outfits for Young Ship Builders, Engineers, Carpenters, etc.

A STATELY GALLEON

This is a fascinating hobby. A complete set of parts for building the "Yellow Carvel." PRICE **12/6**
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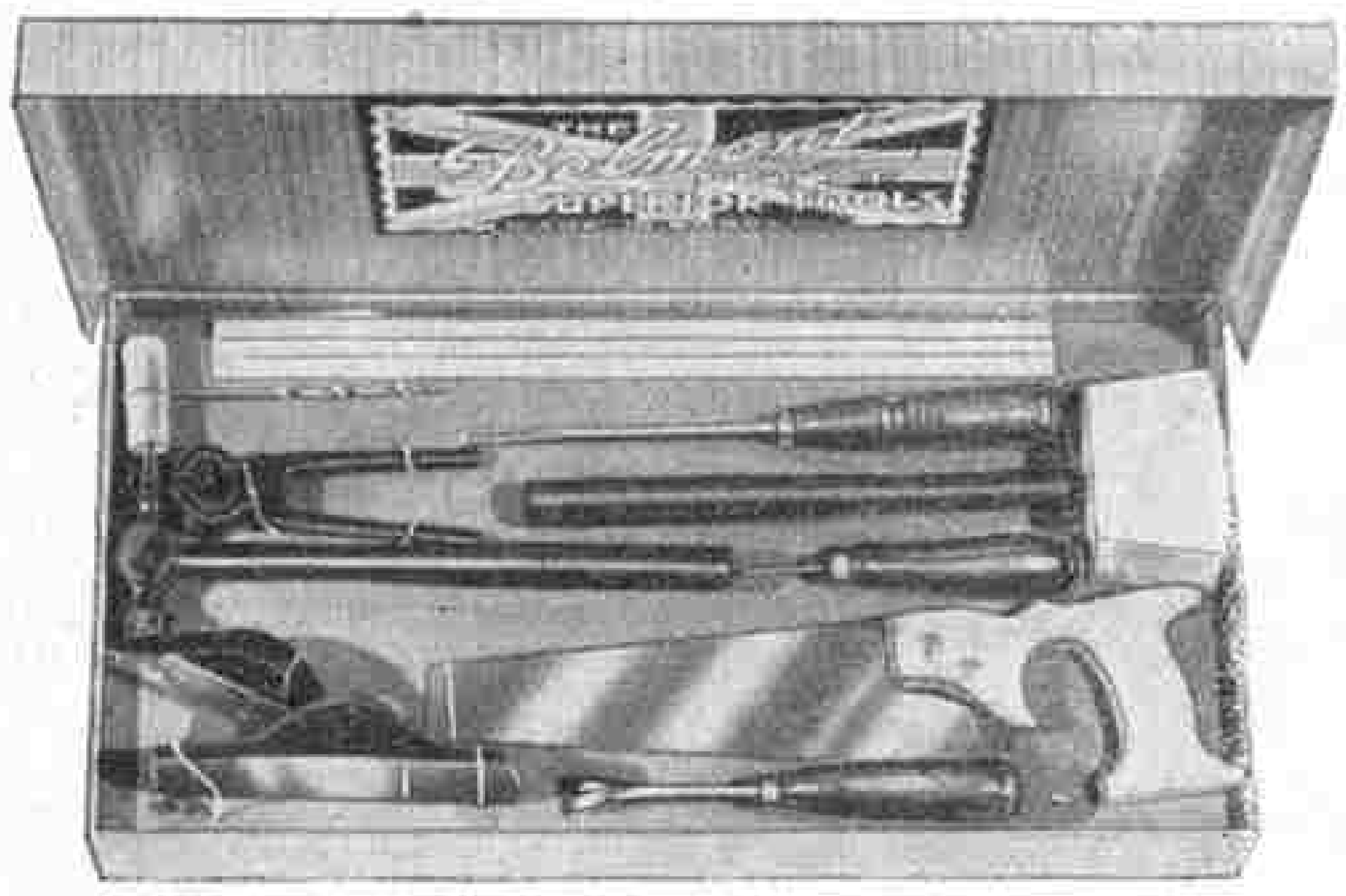
THE JUVENILE TOOL SET!



Containing 12 tools, including plane, pincers, hammer, etc. Packed in strong fibre box. A real young carpenter's outfit. PRICE **5/6**
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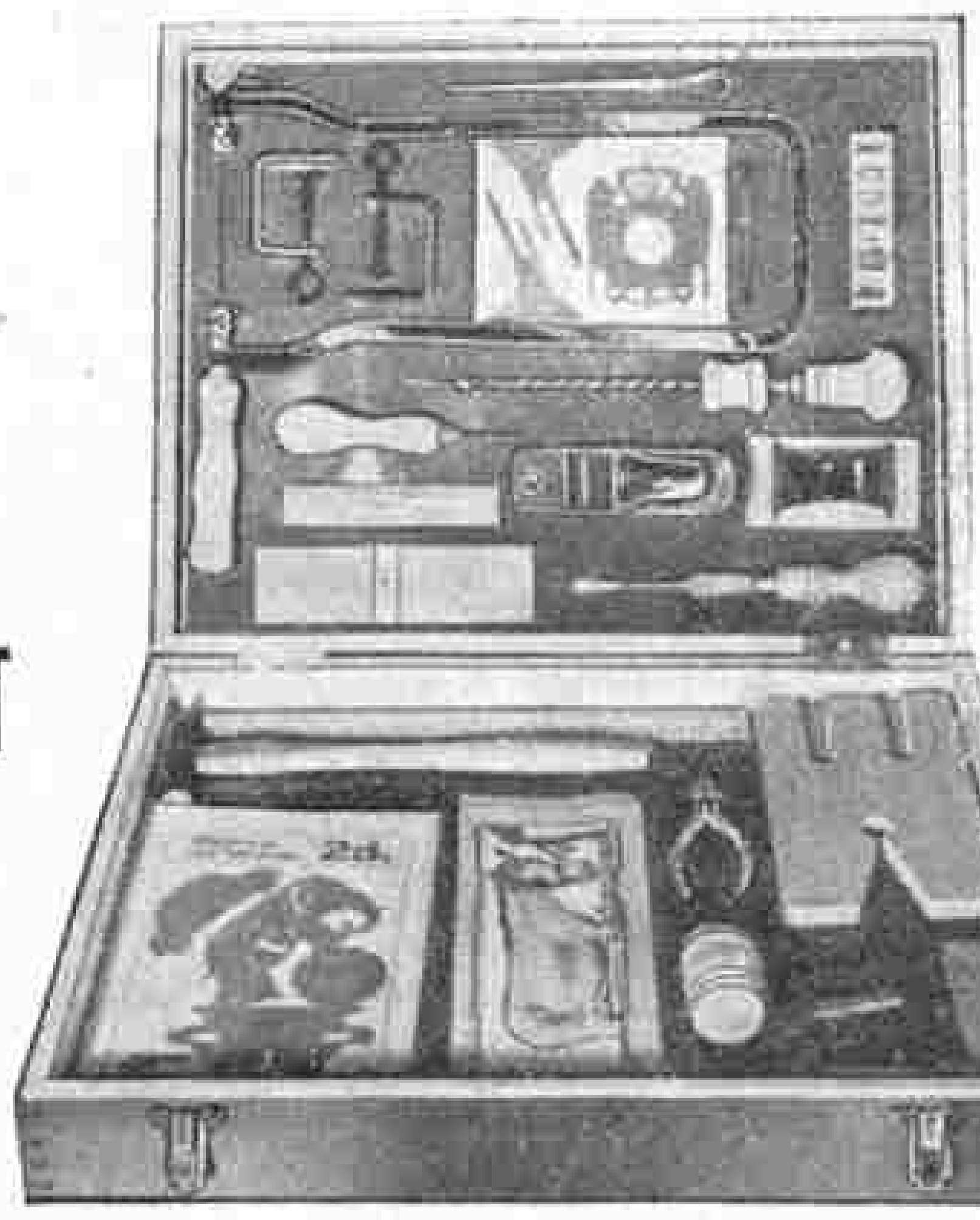
Prize Winners in Hamleys 2nd Annual Model Aeroplane Competition

Seniors—Class A 1st (Trophy) D. H. Elmes, Esq., Ilford
2nd Lt.-Col. A. H. Gatehouse, M.C., Frimley Green
3rd Miss Joan Ridley-Hooper, Ipswich
Class B 1st J. H. Green, Esq., Hampstead
Juniors—Class C 1st (Trophy) Master Terence Fairbairn, Gillingham
2nd Master Eric Mackay, Camberley
3rd Master R. Guerrier, N. Kensington
Consolation Prizes: Masters Julian Crossley, David Keane and Peter Polden
Class D 1st Master Patrick Driscoll, Southfields
2nd Master Colin Clogstoun, Shrewsbury
Consolation Prizes: Masters P. C. Gupta, Dennis C. Pollard and James C. Weedon



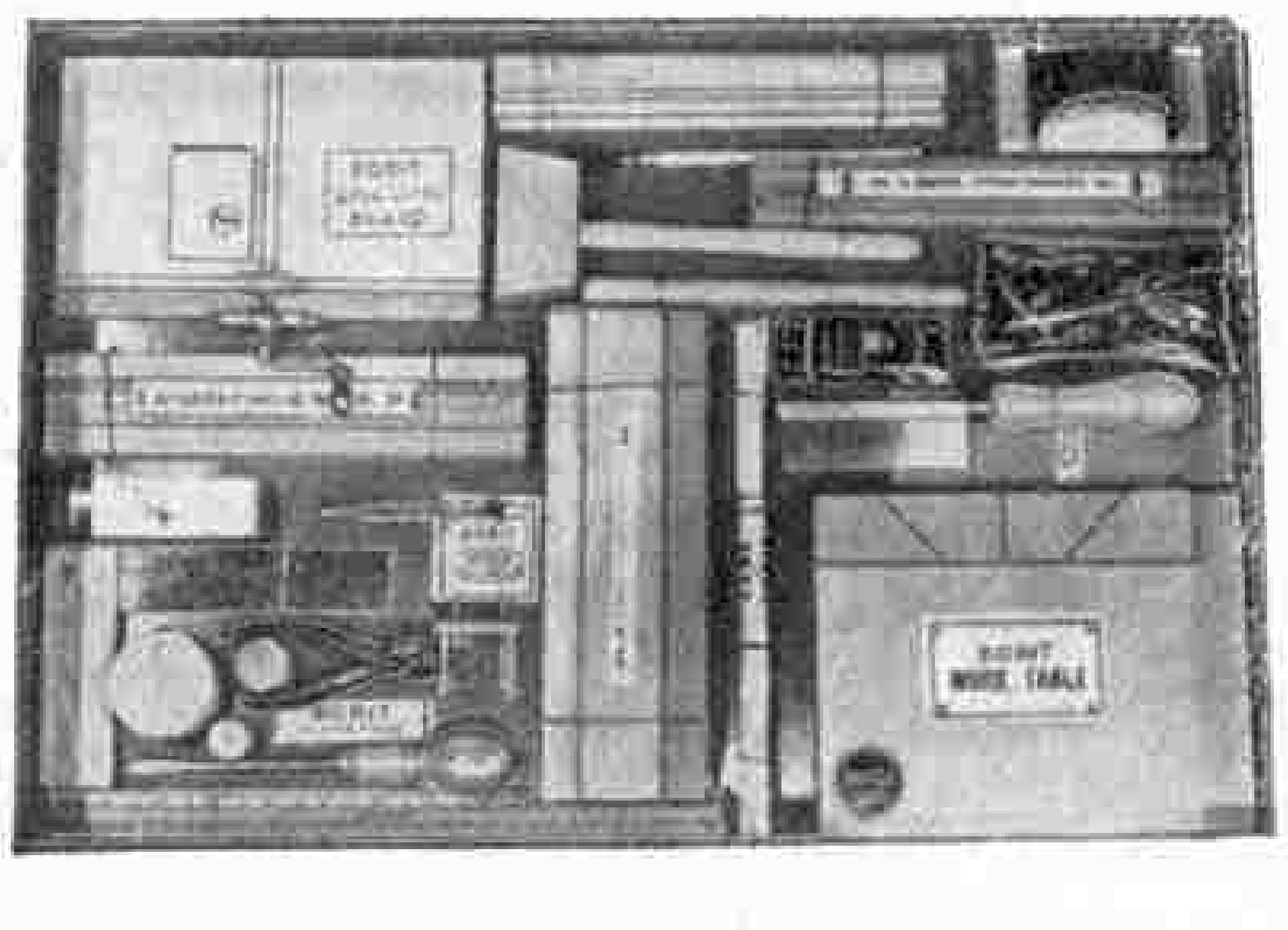
BORIT OUTFIT

(below)

Enables wood to be joined together by dowels. No hammer or nails required. Builds bridges, ships, etc. Fascinating constructional set. PRICE **10/6**
Post 9d.

THE FRETWORK OUTFIT

A complete kit of tools containing 14 in. frame, two cramps, cutting board, drill and bits, patterns, fretwood, etc., contained in strong wood box. A fine fretwork outfit. PRICE **15/-**
Post 9d.



The Superior Fretwork Outfit

Sheffield steel tools comprising 12 in. saw, vice, drill, hammer, pincers, file, awls, cutting table, etc. PRICE **7/6**
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(on right)

Containing 12 tools, including plane, chisel, hammer, etc. Packed in strong fibre box. PRICE **8/9**
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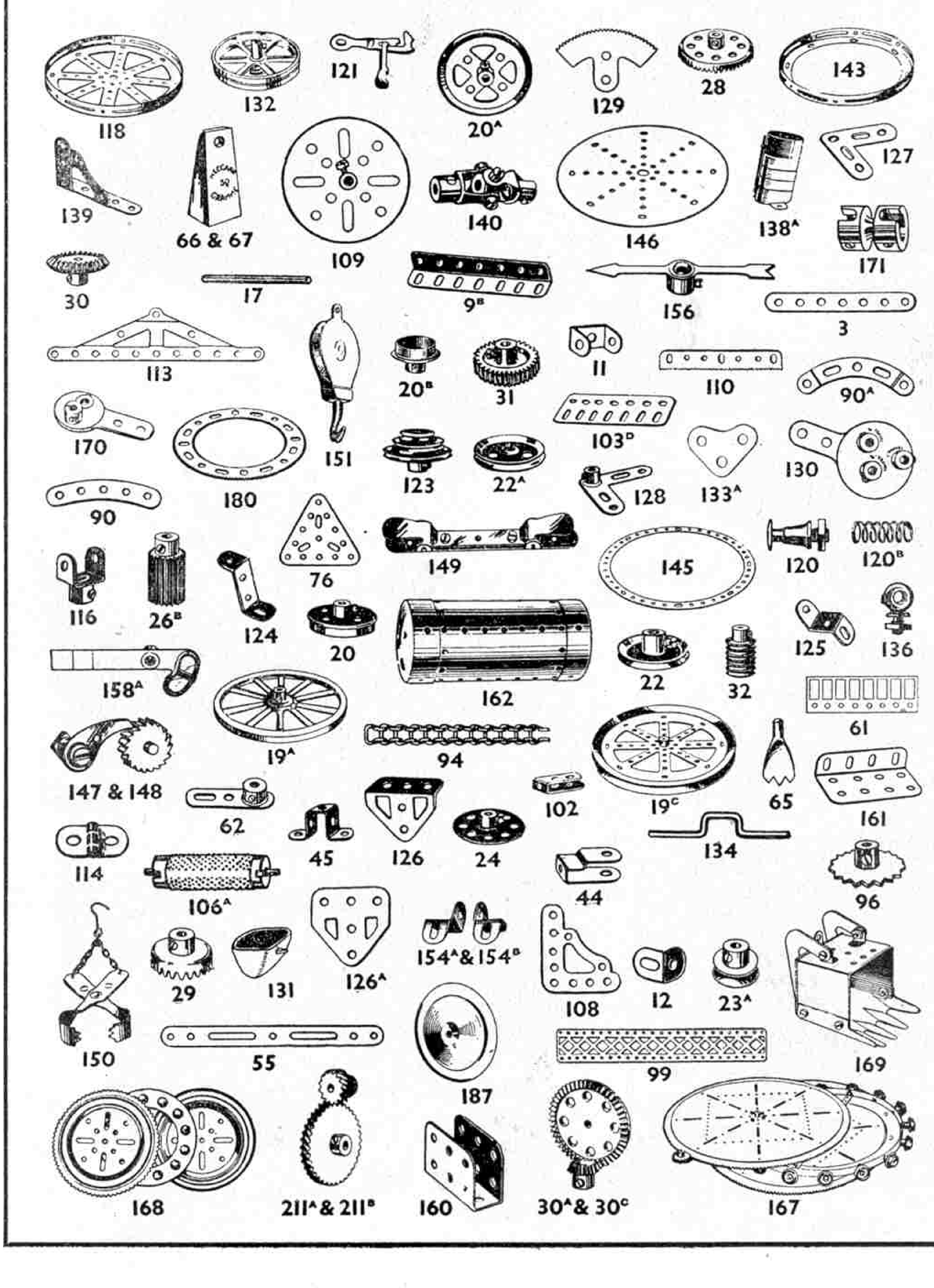
MECCANO

PARTS AND ACCESSORIES

Meccano parts, many of which are illustrated below, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual engineering practice. Ask your dealer for the latest complete illustrated price list.

MECCANO LTD., Binns Road, LIVERPOOL 13

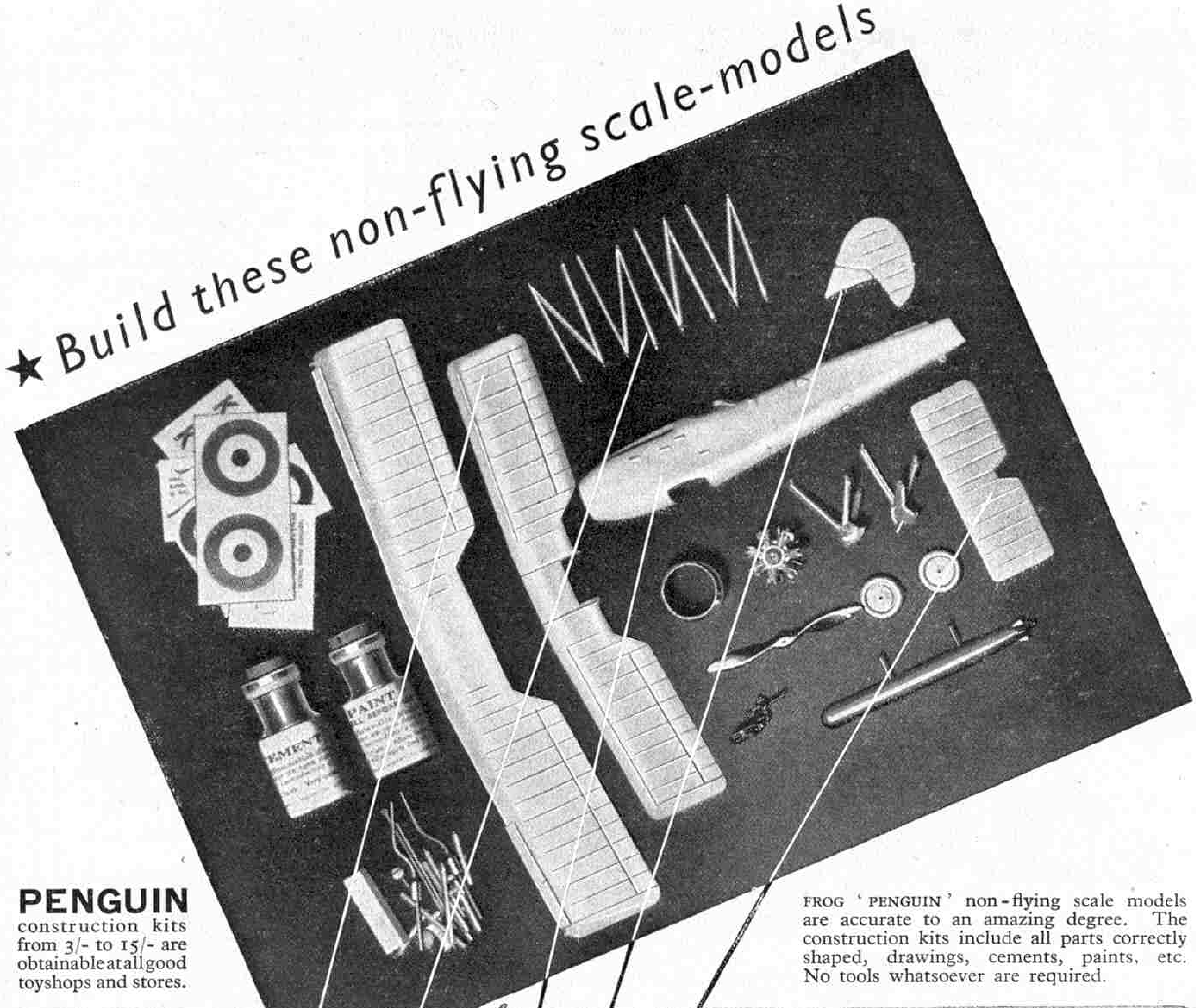


Prices of Parts Illustrated

No.			s.	d.
3	Perforated Strips, 3½" ...	½ doz.	0	5
9b	Angle Girders, 3½" ...	"	0	9
11	Double Brackets... ...	doz.	0	3
12	Angle Brackets, ½" × ½"...	"	0	2
17	Axle Rods, 2"	4 for	0	1
19a	Wheels, 3" diam. ...	each	0	6
20	Flanged Wheels, 1⅛" diam.	"	0	3½
20b	" " ¾" "	"	0	2½
	Pulley Wheels			
19c	6" diam., with centre boss and set screw	"	1	9
20a	2" diam., with centre boss and set screw	"	0	3½
22	1" diam., with centre boss and set screw	"	0	2
23a	½" diam., with centre boss and grub screw ...	"	0	2
22a	1" diam., without centre boss and grub screw...	"	0	1
24	Bush Wheels	"	0	2½
26b	Pinion Wheels, ½" diam., ¾" face	"	0	6
28	Contrate Wheels, 1½" diam.	"	0	6
29	" " ¾" "	"	0	4
30	Bevel Gears, ⅞", 26 teeth	"	0	6
*30a	" " ½", 16 "	"	0	4
*30c	" " 1½", 48 "	"	1	6
31	Gear Wheels, 1", 38 teeth	"	0	9
32	Worms	"	0	3½
44	Cranked Bent Strips ...	"	0	1
45	Double " " ...	"	0	1
55	Perforated Strips, slotted, 5½" long	doz.	1	3
61	Windmill Sails	4 for	0	9
62	Cranks	each	0	2½
65	Centre Forks	"	0	1
66	Weights, 50 grammes ...	"	0	9
67	" 25 " ...	"	0	6
76	Triangular Plates, 2½" ...	"	0	2
90	2½" Curved Strips, 2⅜" rad.	"	0	1
90a	2½" " " cranked, 1⅜" radius	"	0	1
94	Sprocket Chain, per 40" length		0	6
96	" Wheels, 1" diam.	each	0	3
99	Braced Girders, 12½" long	½ doz.	3	0
102	Single Bent Strips ...	each	0	1
103d	Flat Girders, 3½" long ...	½ doz.	0	9
106a	Sand Rollers	each	1	3
108	Architraves	doz.	1	9
109	Face Plates, 2½" diam. ...	each	0	3½
110	Rack Strips, 3½"... ...	"	0	2
113	Girder Frames	"	0	3
114	Hinges	"	0	3
116	Fork Pieces, Large ...	"	0	2½
118	Hub Discs, 5¾" diam. ...	"	1	0
120	Buffers	"	0	2
120b	Compression Springs ...	"	0	1
121	Train Couplings	"	0	1
123	Cone Pulley	"	1	0
124	Reversed Angle Brackets, 1"	½ doz.	0	4½
125	Reversed Angle Brackets, ½"	"	0	3
126	Trunnions	each	0	1½
126a	Flat Trunnions	"	0	1
127	Simple Bell Cranks ...	"	0	1
128	Boss Bell Cranks ...	"	0	3
129	Rack Segments, 3" diam.	"	0	5
130	Eccentrics, Triple throw	"	1	0
131	Dredger Buckets ...	"	0	2½
132	Flywheels, 2¾" diam. ...	"	2	0
133a	Corner Brackets, 1" ...	"	0	1
134	Crank Shafts, 1" stroke ...	"	0	1
136	Handrail Supports ...	"	0	3
†138a-z	Ships' Funnels, Raked ...	"	0	9
139	Flanged Brackets (right)	"	0	2
140	Universal Couplings ...	"	0	9
143	Circular Girders, 5½" diam.	"	0	10
145	Circular Strips, 7½" diam.	"	1	0
146	Circular Plates, 6" diam.	"	0	7
147	Pawls	"	0	3
148	Ratchet Wheels	"	0	4
149	Collecting Shoes ...	"	1	3
150	Crane Grabs	"	0	6
151	Pulley Blocks, Single Sheave	"	0	7
154a	Corner Angle Brackets, ½" (right hand) ...	½ doz.	0	3
154b	Corner Angle Brackets, ½" (left hand)	"	0	3
156	Pointers, 2½" overall ...	each	0	4
158a	Signal Arms, Home ...	"	0	5
160	Channel Bearings, 1½" × 1" × ½"	"	0	2
161	Girder Brackets, 2" × 1" × ½"	2 for	0	3
162	Boiler, Complete ...	each	0	11
167	Geared Roller Bearings...	"	20	0
168	Ball Bearing, 4" diam. ...	"	3	0
169	Digger Buckets	"	1	6
170	Eccentrics, ¼" throw ...	"	0	9
171	Socket Couplings ...	"	0	11
180	Toothed Gear Rings, 3½" diam. 133 teeth external, 95 teeth internal...	"	1	0
187	Road Wheels	"	0	4
*211a	Helical Gear, ½" ...	"	0	10
*211b	" " 1½" ...	"	2	3

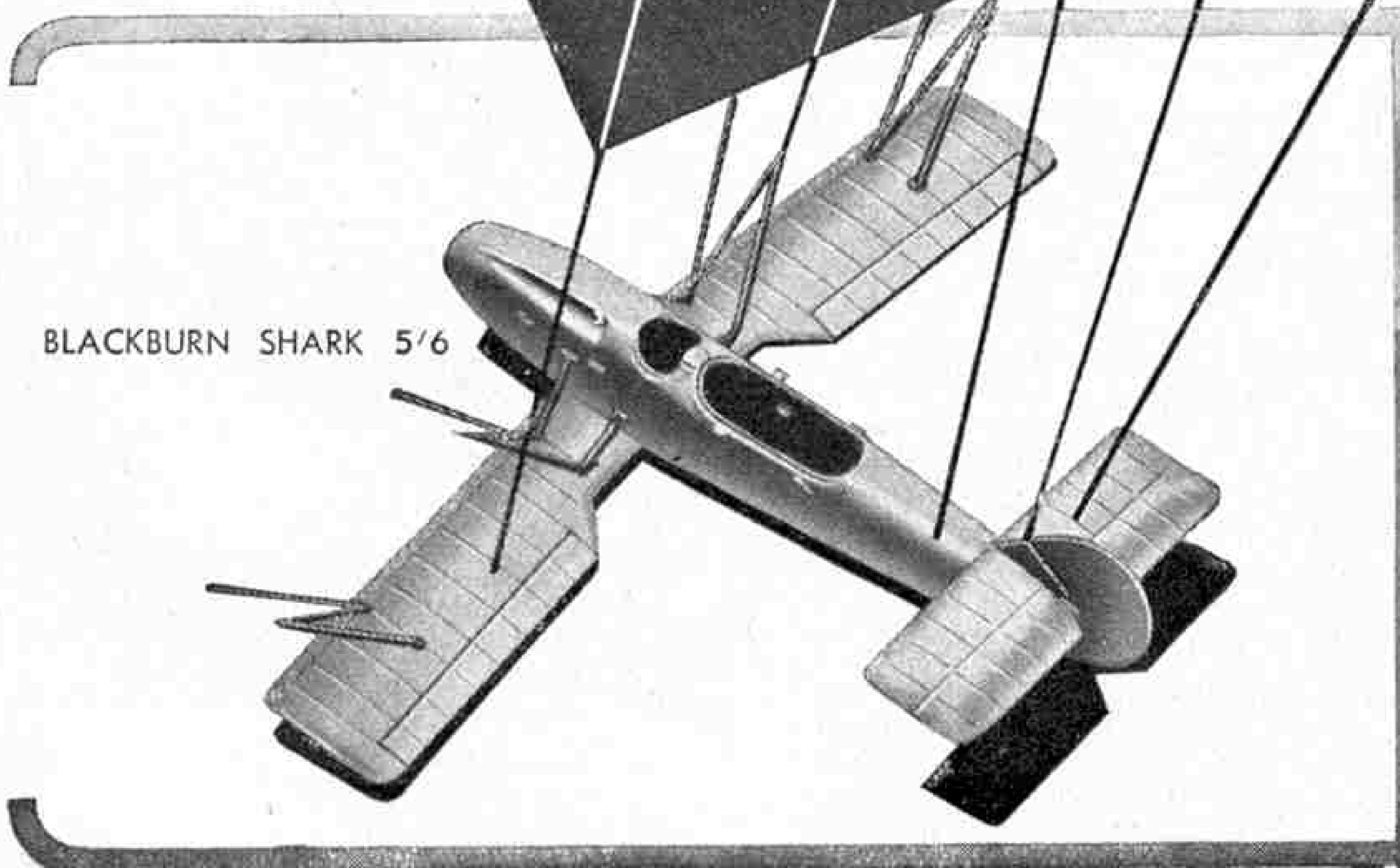
**Can only be used together.*

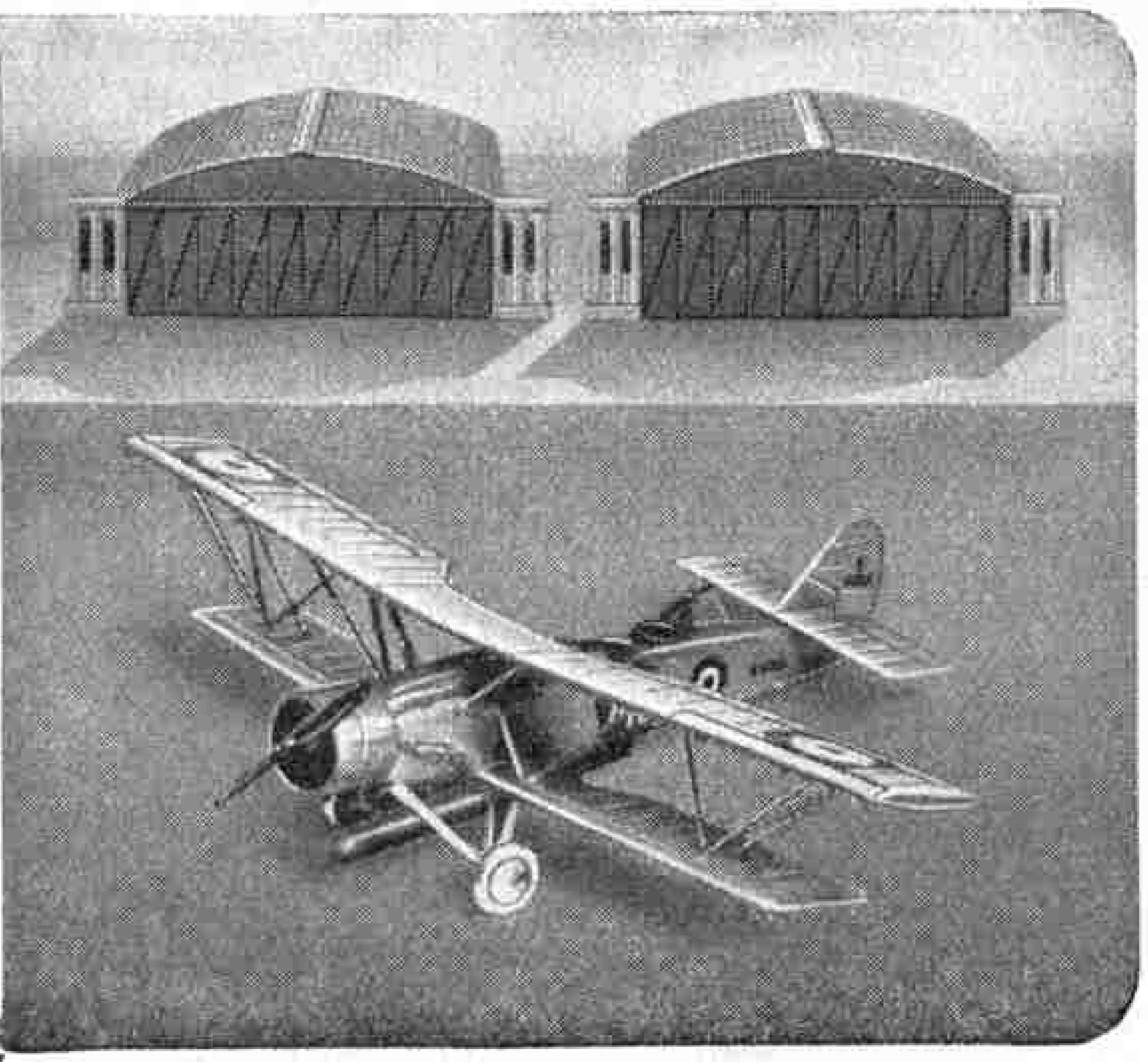
†The series includes 26 different Funnels.



PENGUIN
construction kits from 3/- to 15/- are obtainable at all good toyshops and stores.

FROG 'PENGUIN' non-flying scale models are accurate to an amazing degree. The construction kits include all parts correctly shaped, drawings, cements, paints, etc. No tools whatsoever are required.


BLACKBURN SHARK 5/6



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ADDRESS

Feb., 38

PERFECT SCALE MODELS

DINKY TOYS

OVER 250 VARIETIES

Collecting Dinky Toys is one of the most fascinating of all hobbies. These realistic miniatures are unique in their rich colouring and perfection of design and finish, and their range is so wide as to appeal to all tastes.

This season, in addition to reducing the prices of many of the existing models and sets, we have introduced several new items, including wonderful scale models of military Tanks and Aeroplanes, latest types of Motor Cars, complete with driver and passenger, and many others.

Every boy or girl who has not already done so should start this delightful collecting hobby to-day. All the models can be purchased either separately or in complete sets.

ROYAL TANK CORPS PERSONNEL

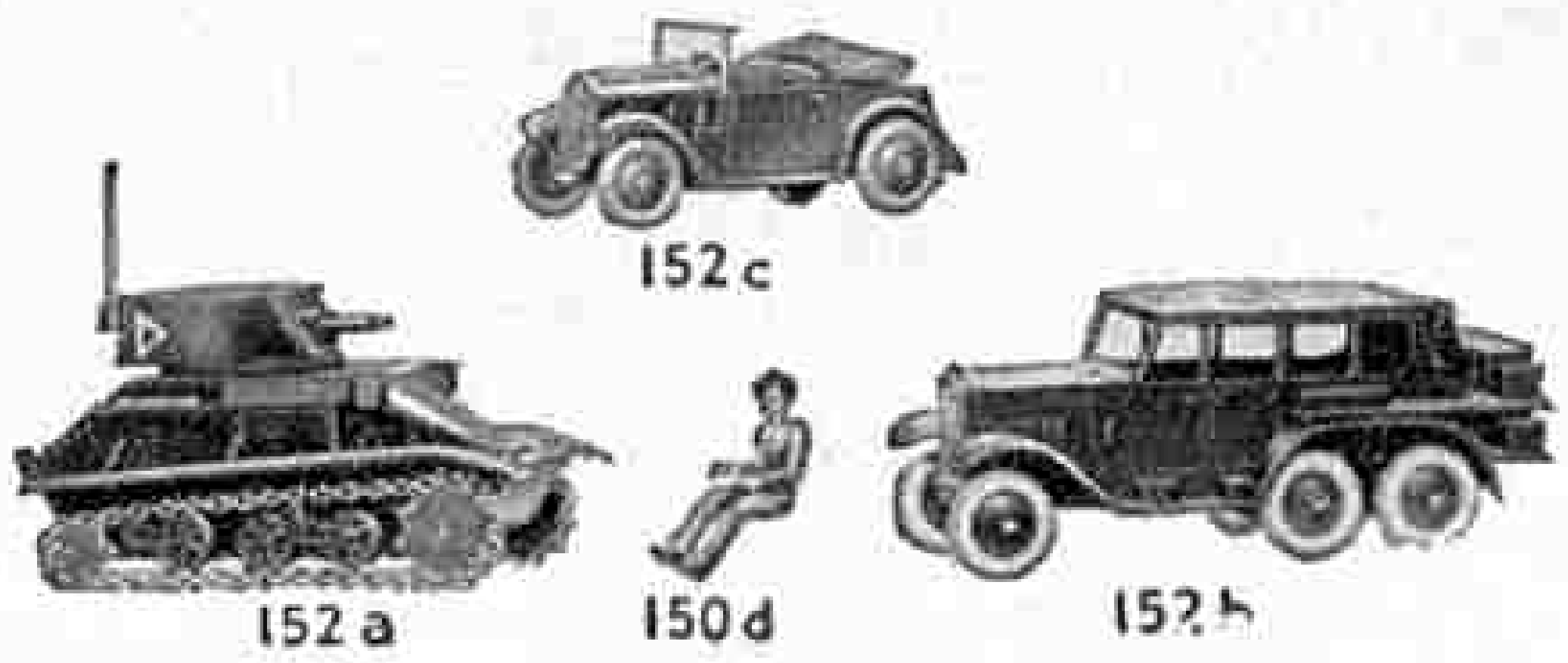
Dinky Toys No. 150

No. 150a	Officer	each **3d.**
No. 150b	Private in sitting position (2) ...	„ **3d.**
No. 150c	Private in standing position (2) ...	„ **3d.**
No. 150e	N.C.O.	„ **3d.**

Price of complete set **1/6**

Dinky Toys Nos. 150b, 150c, 150d and 150e can each be purchased in boxes containing one dozen at the special price of **2/9** per box.

ROYAL TANK CORPS LIGHT TANK SET



Dinky Toys No. 152

No. 152a	Light Tank (4½ tons, 25 h.p.) ...	... each **1/2**
No. 152b	Reconnaissance Car ...	„ **1/-**
No. 152c	Austin Seven Car ...	„ **4d.**
No. 150d	Driver	„ **3d.**

Price of complete set **2/9**

AUSTIN SEVEN CAR

Dinky Toys No. 35d

This model is the same as No. 152c, illustrated above, except that it is finished in a range of different colours. Price **4d.** each.

ROYAL TANK CORPS MEDIUM TANK SET

Dinky Toys No. 151

No. 151a	Medium Tank (12 tons, 90 h.p.) ...	... each **1/6**
No. 151b	Three-ton Transport Wagon	„ **1/1**
No. 151c	Cooker Trailer with jack stand ...	... each **7d.**
No. 151d	Water Tank Trailer ...	„ **6d.**
No. 150d	Driver	„ **3d.**

Price of complete set **3/11**

POLICE MOTOR CYCLIST

Dinky Toys No. 37b

Price **6d.** each

CIVILIAN MOTOR CYCLIST

Dinky Toys No. 37a

Assorted colours. Price **6d.** each

Royal Corps of Signals Despatch Rider. Dinky Toys No. 37c Similar to Dinky Toys No. 37b. Finished in correct colours. Rubber tyres. Price **6d.** each

SIX WHEELED WAGON

Dinky Toys No. 25s

An interesting model of a modern three-ton wagon. In assorted colours.

Price **1/-** each.

ROYAL AIR MAIL SERVICE CAR

Dinky Toys No. 34a

In correct colours and fitted with detachable rubber tyres.

Price **6d.** each.

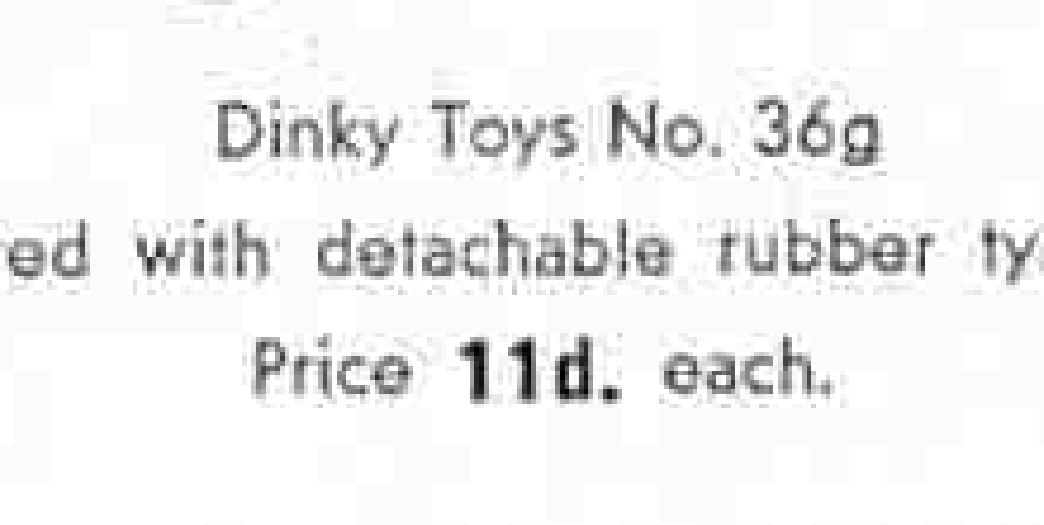
ARMSTRONG WHITWORTH "WHITLEY" BOMBER

Dinky Toys No. 60v

Scale model of the "Whitley" long-range heavy bomber adopted by the R.A.F.

Price **9d.** each

TAXI WITH DRIVER



Dinky Toys No. 36g

Fitted with detachable rubber tyres.

Price **11d.** each.

STREAMLINE FIRE-ENGINE

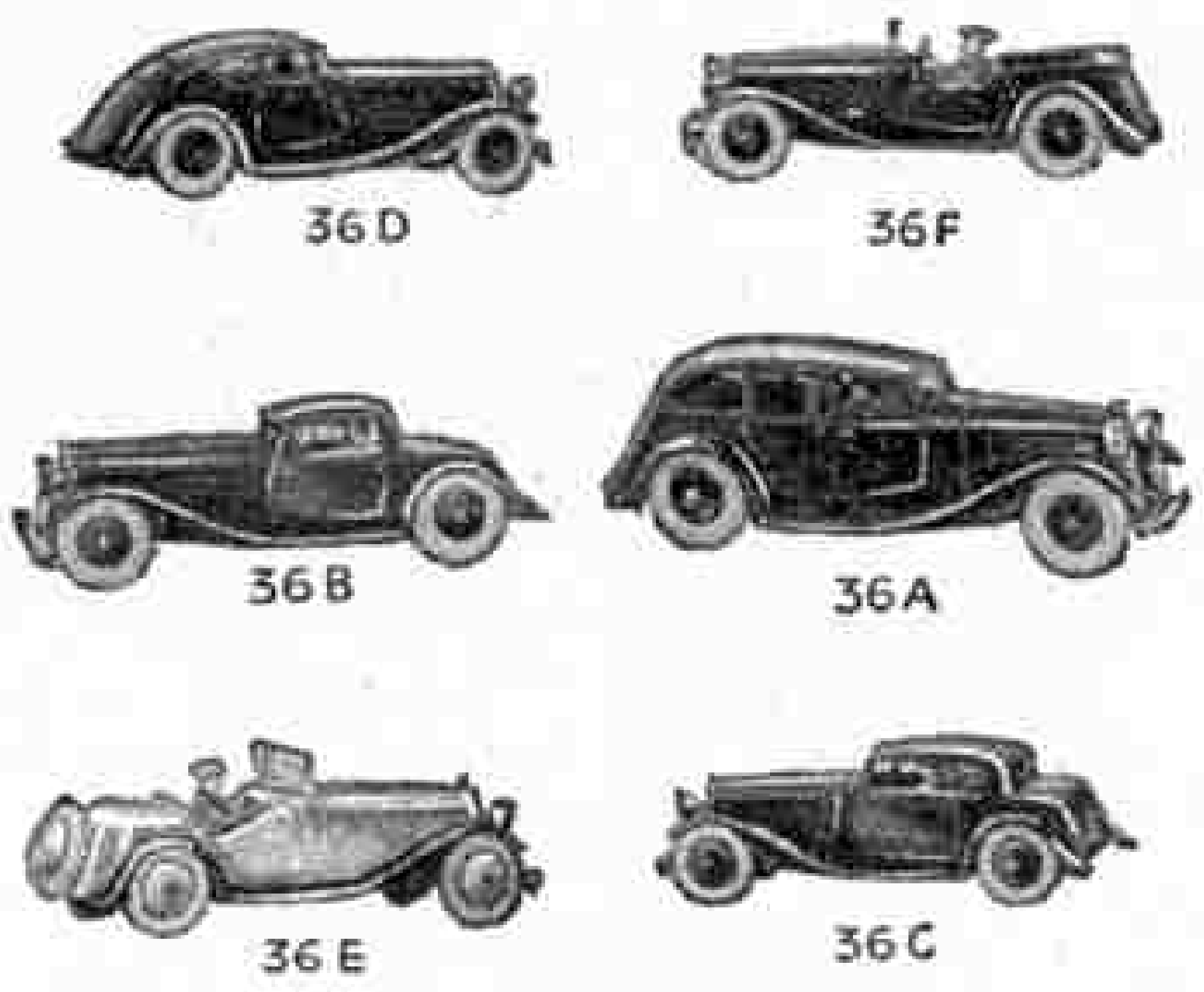
Dinky Toys No. 25k

Finished in red.

Fitted with six firemen, bell, ladder and detachable rubber tyres. Price **1/-**

MOTOR CARS

WITH DRIVERS, PASSENGERS, Etc.



Dinky Toys No. 36

Fitted with detachable rubber tyres.

Silver-plated radiators.

No. 36a	Armstrong Siddeley (Limousine) with driver and footman ...	each **11d.**
No. 36b	Bentley (Two-seater Sports Coupe) with driver and passenger ...	„ **11d.**
No. 36c	Humber (Vogue Saloon) with driver and footman	„ **11d.**
No. 36d	Rover (Streamline Saloon) with driver and passenger	„ **11d.**
No. 36e	British Salmson (Two-seater Sports) with driver	„ **11d.**
No. 36f	British Salmson (Four-seater Sports) with driver	„ **11d.**

Price of complete set **5/6**

EMPIRE FLYING BOATS

Dinky Toys No. 60r

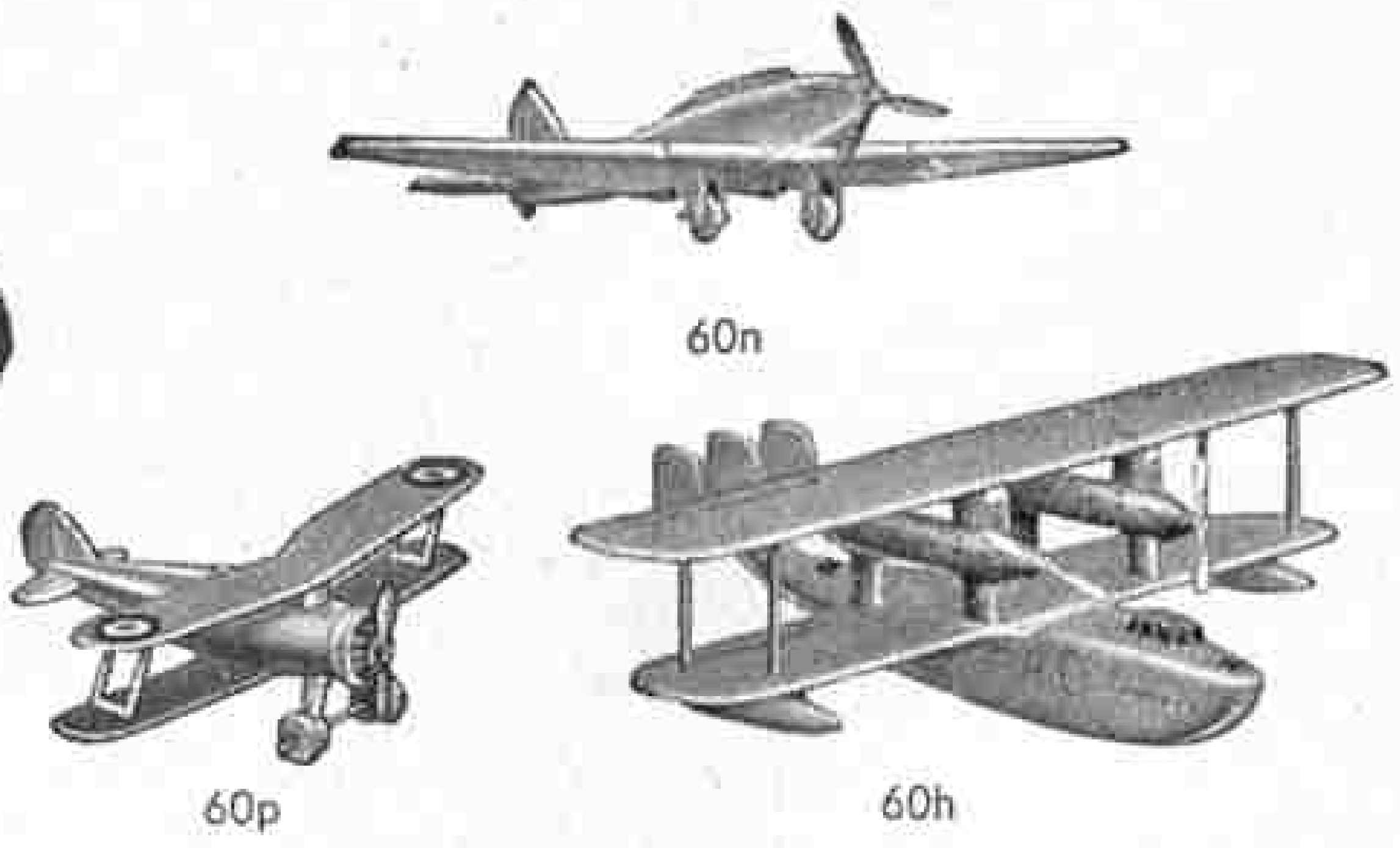
Scale models of the latest Imperial Airways Flying Boats. Twelve models available named: "*Caledonia*," "*Canopus*," "*Corsair*," "*Challenger*," "*Centurion*," "*Cambria*," "*Calpurnia*," "*Ceres*," "*Clio*," "*Calypso*," "*Corinna*" and "*Cheviot*." Price **1/-** each

ATLANTIC FLYING BOAT

Dinky Toys No. 60x

Similar in type to the Empire Flying Boat. Assorted colours. Price **1/-** each

R.A.F. AEROPLANES



Dinky Toys No. 61

No. 60h	"Singapore" Flying Boat	each **1/-**
No. 60n	Fairey "Battle" Bomber (2)... ...	„ **4½d.**
No. 60p	Gloster "Gladiator" Biplane (2) ...	„ **6d.**

Price of complete set **2/9**

MEDIUM BOMBER

Dinky Toys No 60s

Similar to Fairey "Battle" Bomber (No. 60n), but with new Air Ministry Shadow Shading. Price **6d.** each

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

A FASCINATING COLLECTING HOBBY

DINKY TOYS

FINISHED IN RICH COLOURS

ROBOT TRAFFIC SIGNAL

Dinky Toys No. 47a
(Four face)
Price **3d.** each
No. 47b (Three face)
Price **3d.** each
No. 47c (Two face) Right-angle or back-to-back. Price **3d.** each

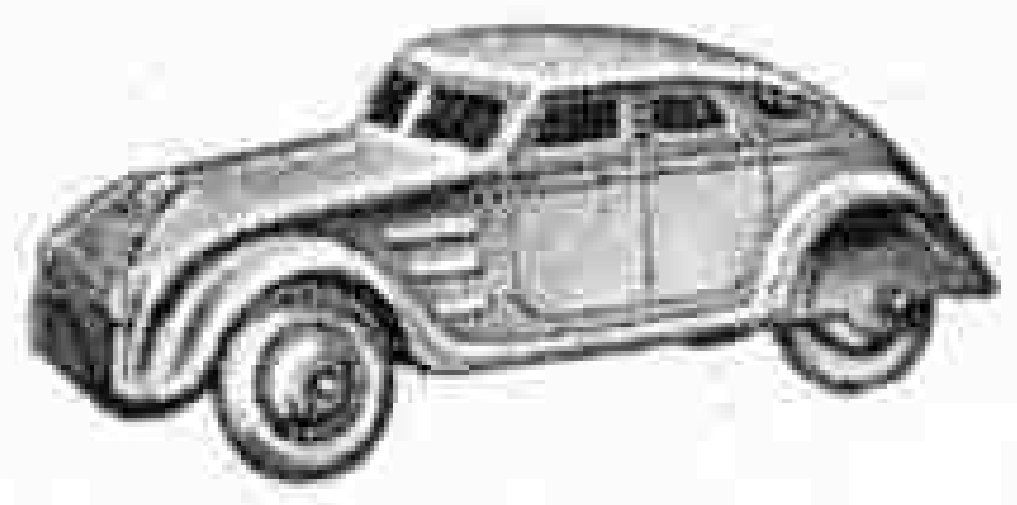
BEACON

Dinky Toys No. 47d
Realistic model of the Belisha Safety Beacon.
Price **1d.** each

D.H. "COMET" AEROPLANE

Dinky Toys No. 60g
Scale model of the aeroplane used by Flying Officer A. E. Clouston and Mrs. Kirby-Green in their record flight to Capetown and back. Price **6d.** each

STREAMLINE SALOON

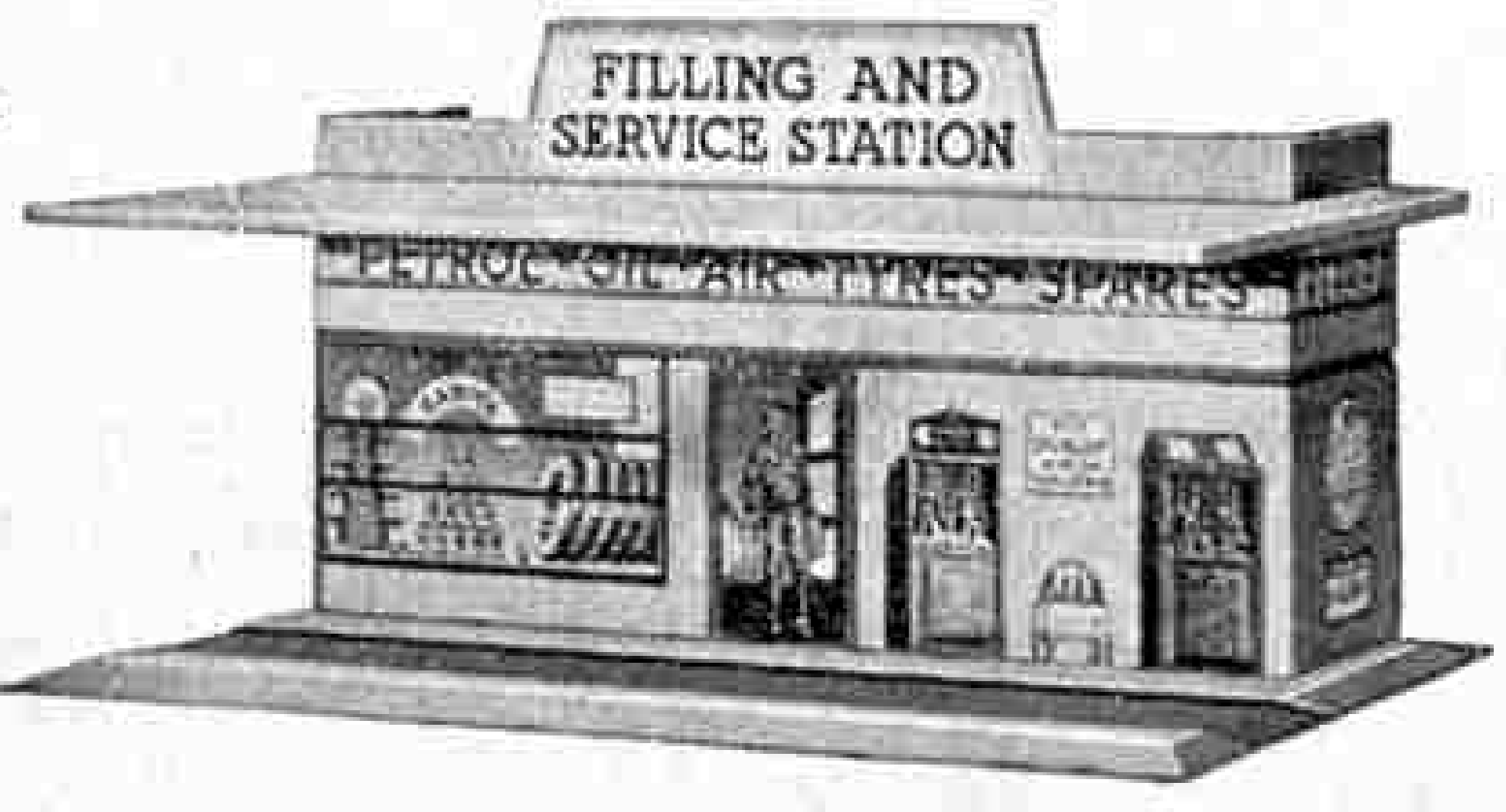


Dinky Toys No. 22b
Assorted colours. Fitted with detachable rubber tyres
Price **4d.** each

MOTOR TRUCK

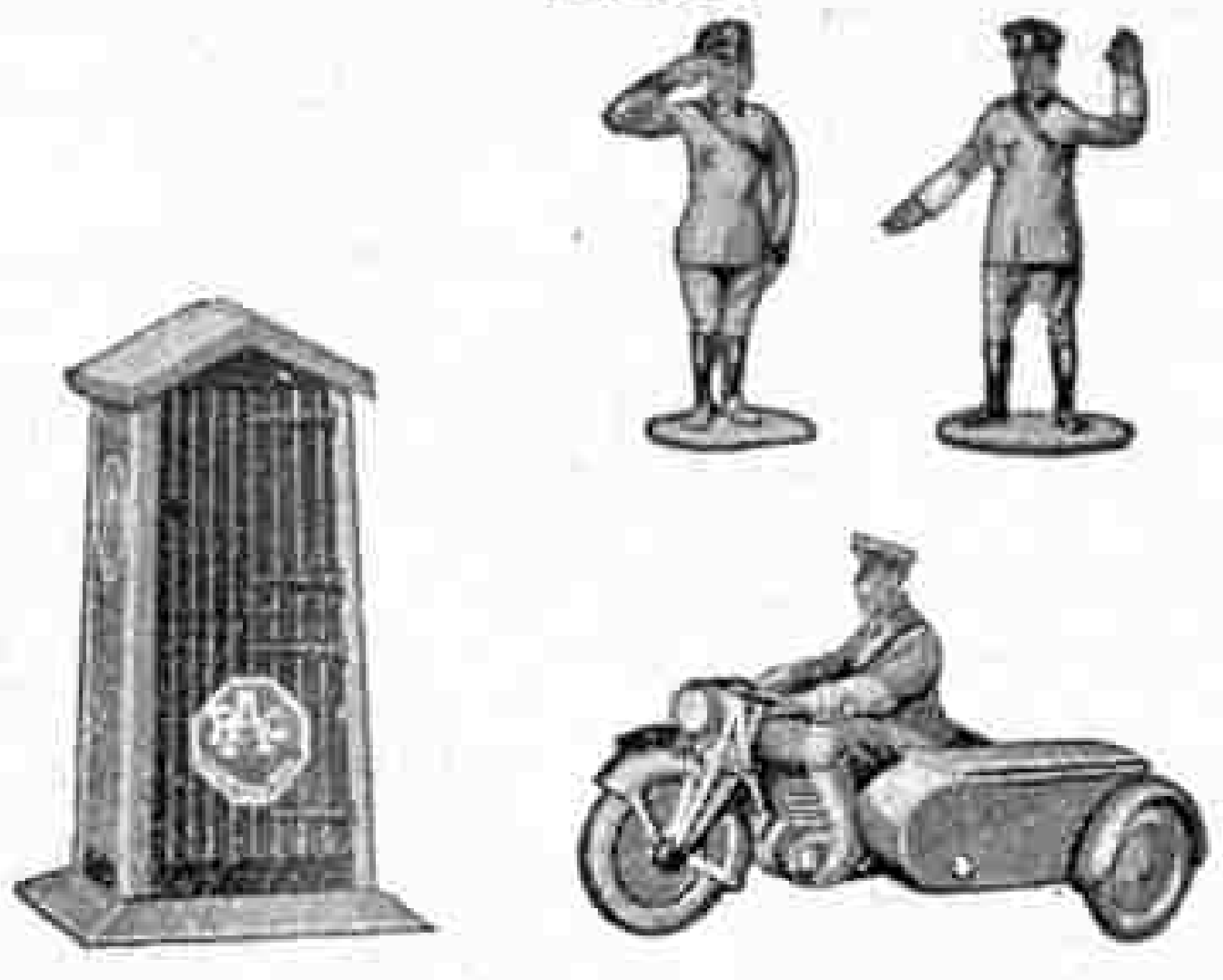
Dinky Toys No. 22c
Assorted colours.
Fitted with detachable rubber tyres.
Price **6d.** each

PETROL STATION



Dinky Toys No. 48
Accurate reproduction of a filling station.
Price **1/3** each

R.A.C. BOX, MOTOR CYCLE PATROL AND GUIDES

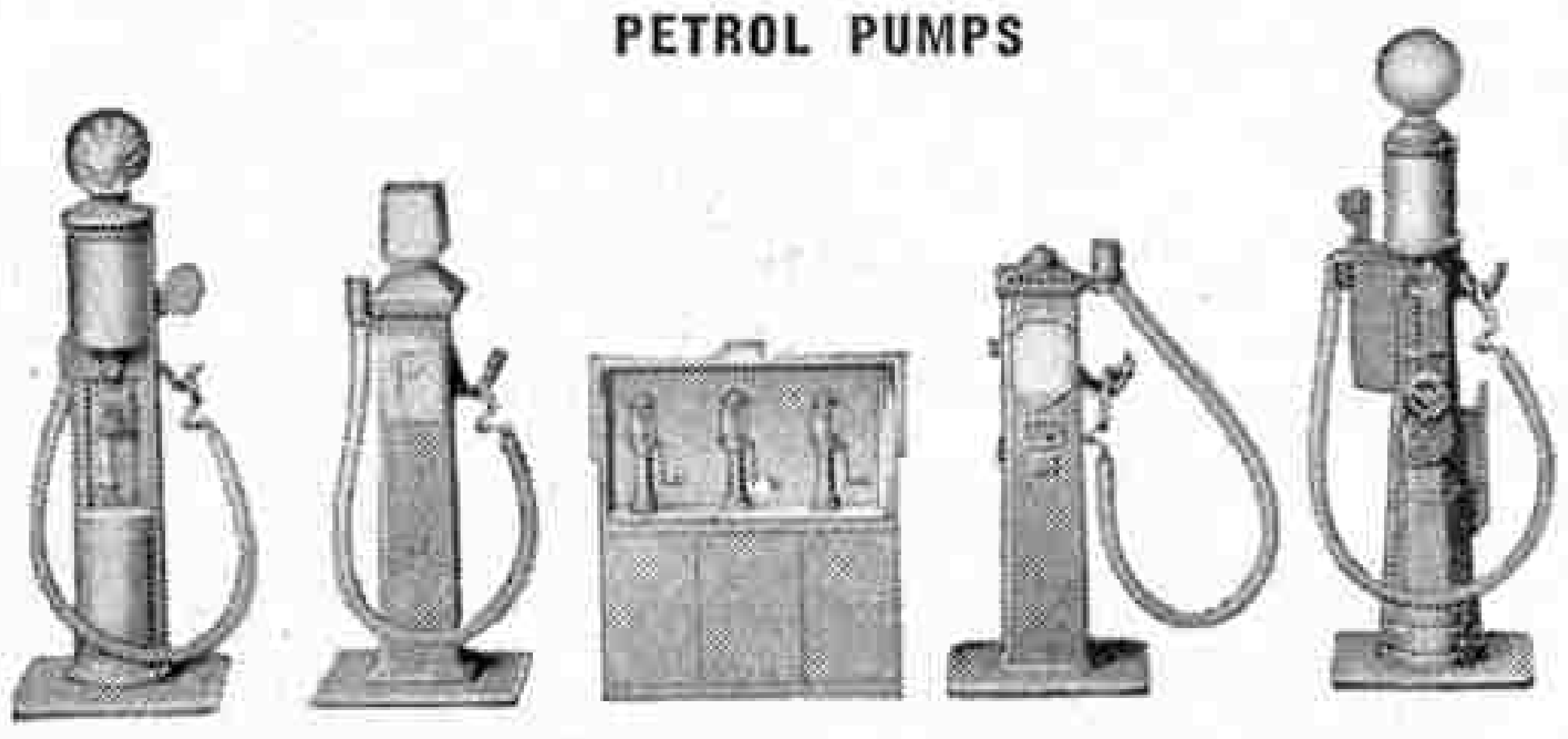


Dinky Toys No. 43
This set is representative of the familiar personnel and road box of the R.A.C. Each item is finished in correct colours.

No. 43a R.A.C. Box	each **6d.**
No. 43b R.A.C. Motor Cycle Patrol ...	„ **9d.**
No. 43c R.A.C. Guide directing traffic ...	„ **3d.**
No. 43d R.A.C. Guide at the salute ...	„ **3d.**

Price of complete set **1/9**

PETROL PUMPS

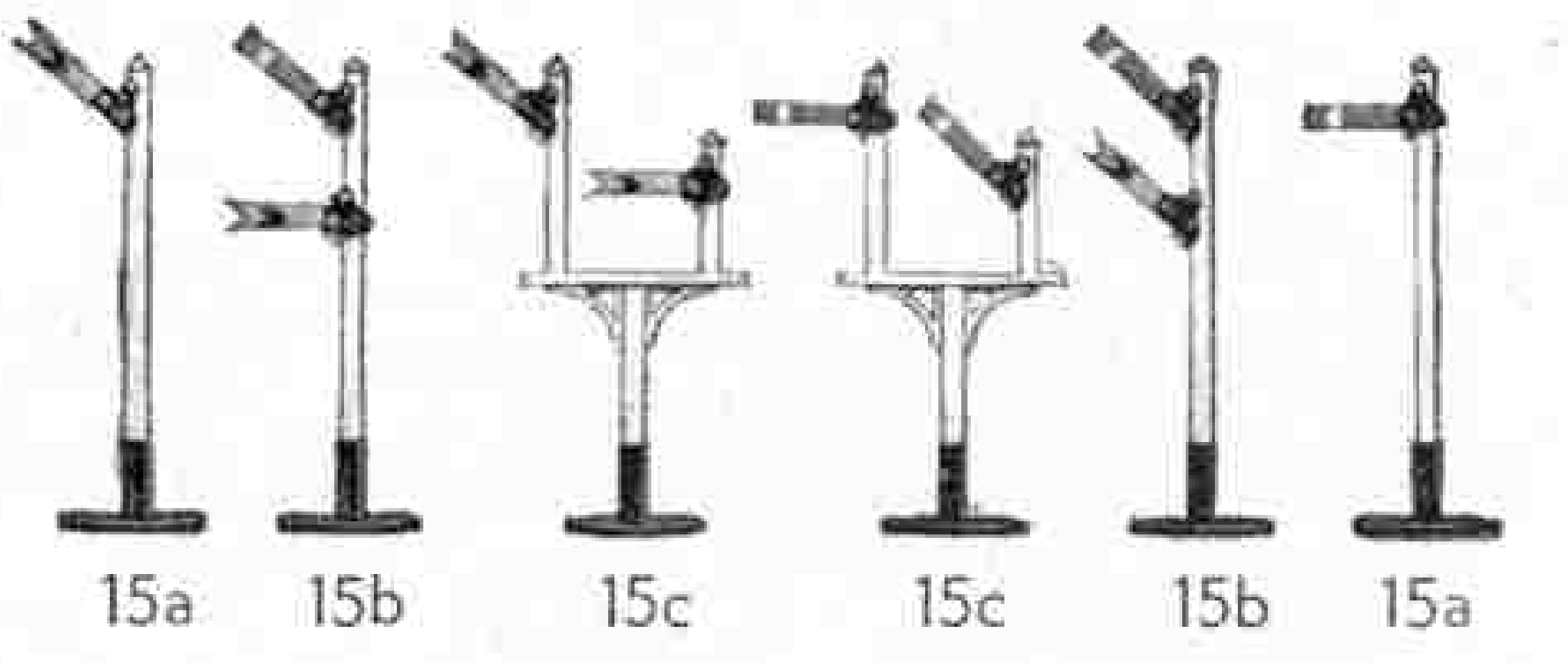


Dinky Toys No. 49
Scale models fitted with rubber hose pipes. Finished in correct colours.

No. 49a Bowser Pump	each **3d.**
No. 49b Wayne Pump	„ **3d.**
No. 49c Theo Pump	„ **3d.**
No. 49d Shell Pump	„ **3d.**
No. 49e Oil Bin (Pratts)	„ **3d.**

Price of complete set **1/3**

RAILWAY SIGNALS



Dinky Toys No. 15

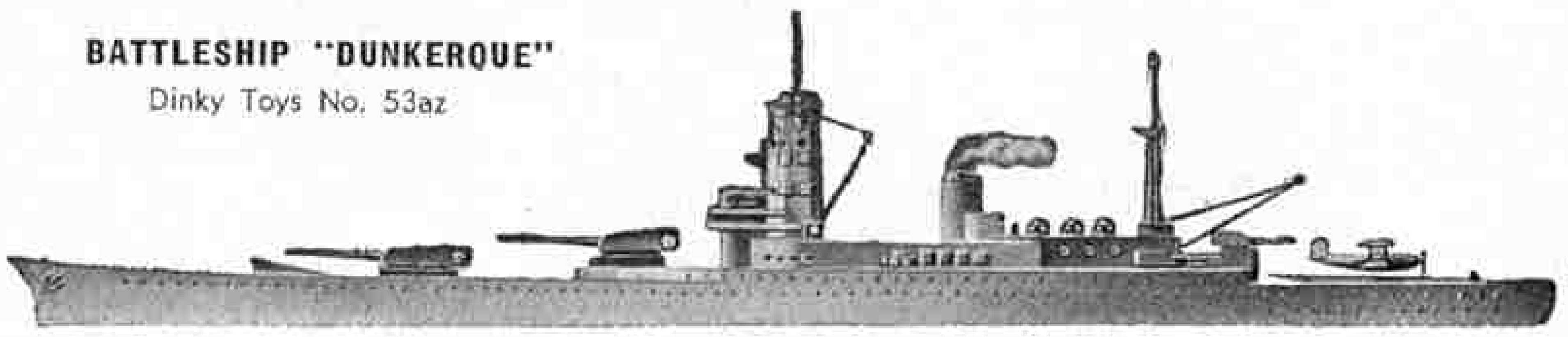
No. 15a Single Arm Signals ("Home" and "Distant")	each **2d.**
No. 15b Double Arm Signals (two in set)	„ **3d.**
No. 15c Junction Signals ("Home" and "Distant") ...	„ **4d.**

Price of complete set **1/6**

A SELECTION OF DINKY TOYS MADE IN THE MECCANO FACTORY IN PARIS

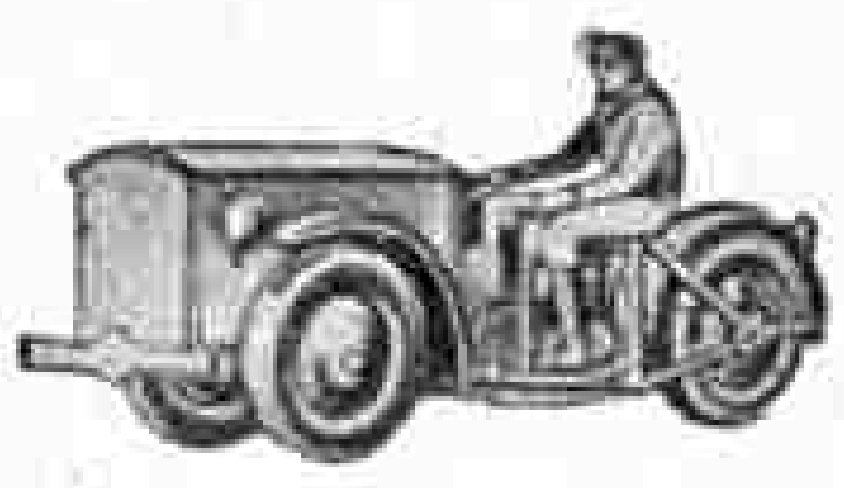
BATTLESHIP "DUNKERQUE"

Dinky Toys No. 53az



Scale model of the French 26,500 ton Battleship *"Dunkerque,"* which has an overall length of 702 ft. 9 in., and a main armament of eight 13 in. guns. Price **9d.** each
(Made in the Meccano Factory in Paris)

THREE-WHEELED DELIVERY VAN



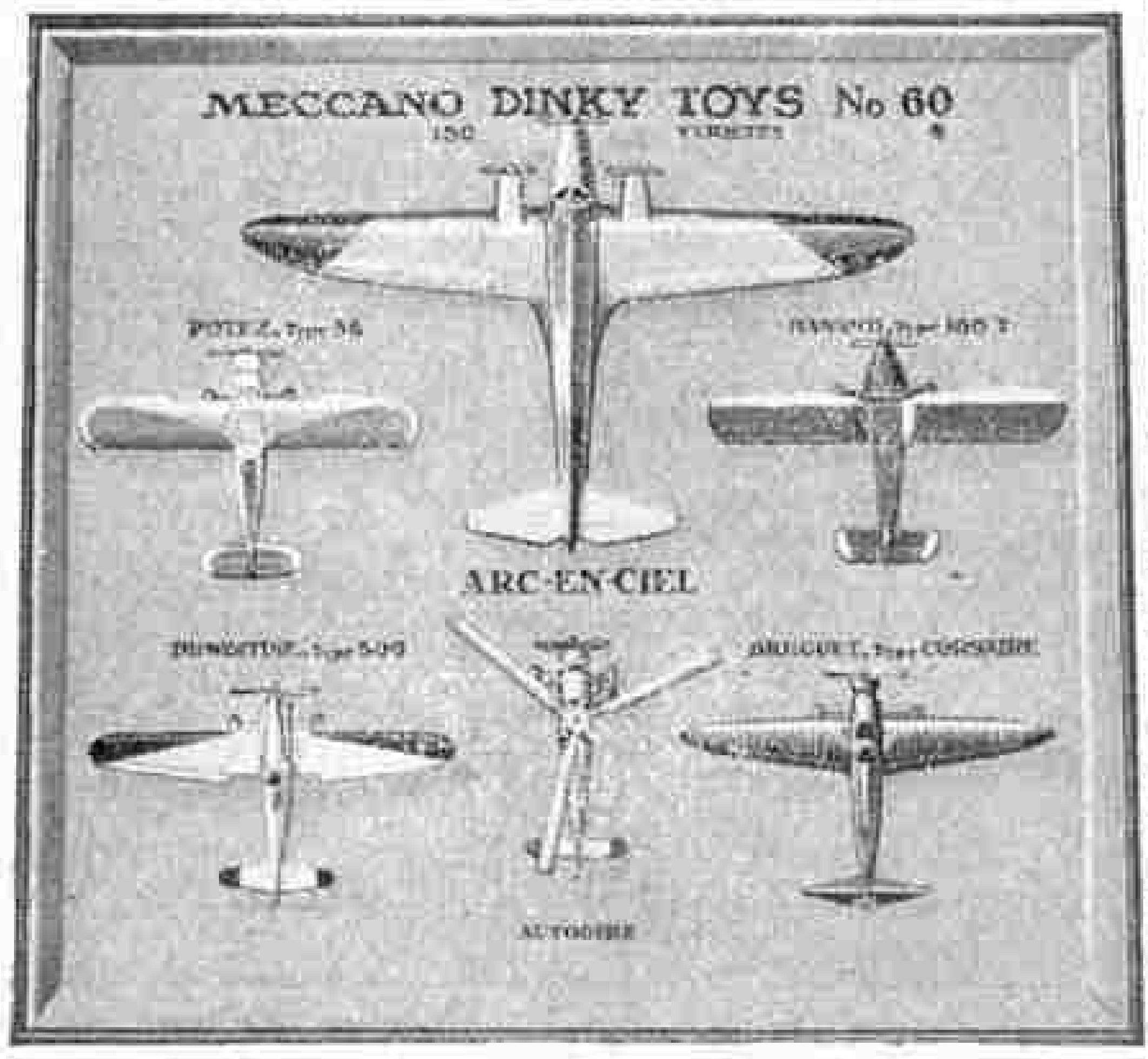
Dinky Toys No. 14z
Fitted with opening lid.
Price **10d.** each
(Made in the Meccano Factory in Paris)

MONOPLANE "ARC-EN-CIEL"

Dinky Toys No. 60az

A scale model of the famous French triple-engined monoplane *"Arc-en-Ciel"* that made several fine pioneer double crossings of the South Atlantic. Price **9d.**
(Made in the Meccano Factory in Paris)

AEROPLANES



Dinky Toys No. 60z
The set consists of six models of famous French aeroplanes as follows: *"Arc-en-Ciel,"* Potez 58, Hanriot H180T, Breguet-Corsaire low wing monoplane, Dewoitine 500 and Cierva Autogiro. Price **3/-**
(Made in the Meccano Factory in Paris)

RAIL CAR, BUGATTI TYPE

Dinky Toys No. 26z Price **5d.**
(Made in the Meccano Factory in Paris)

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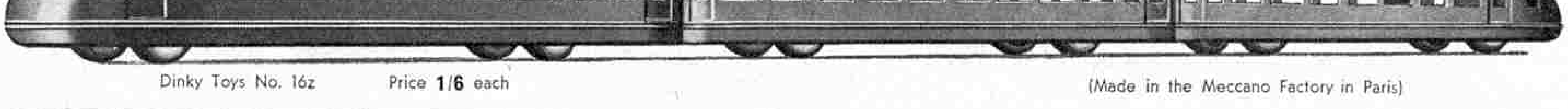

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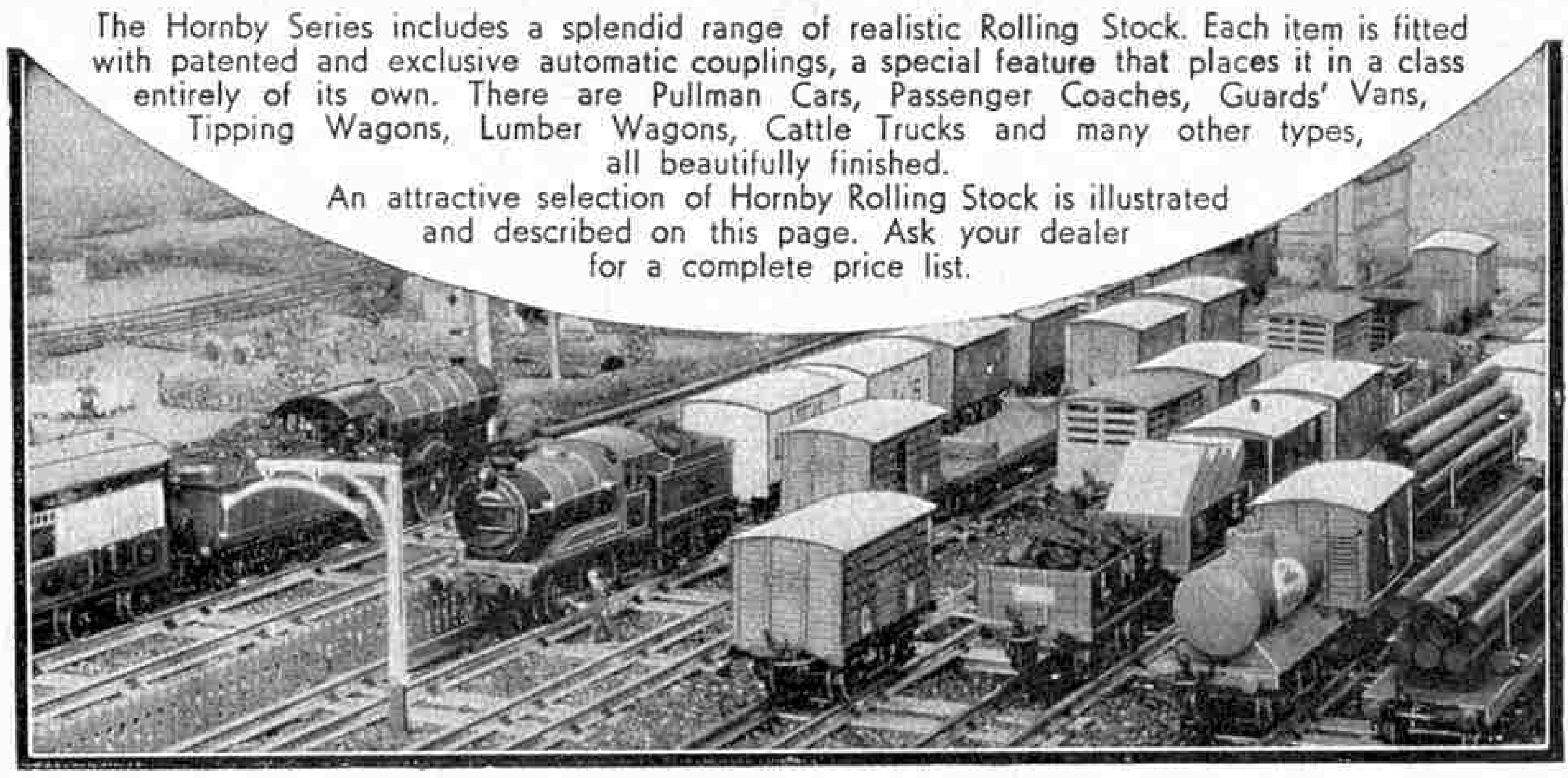

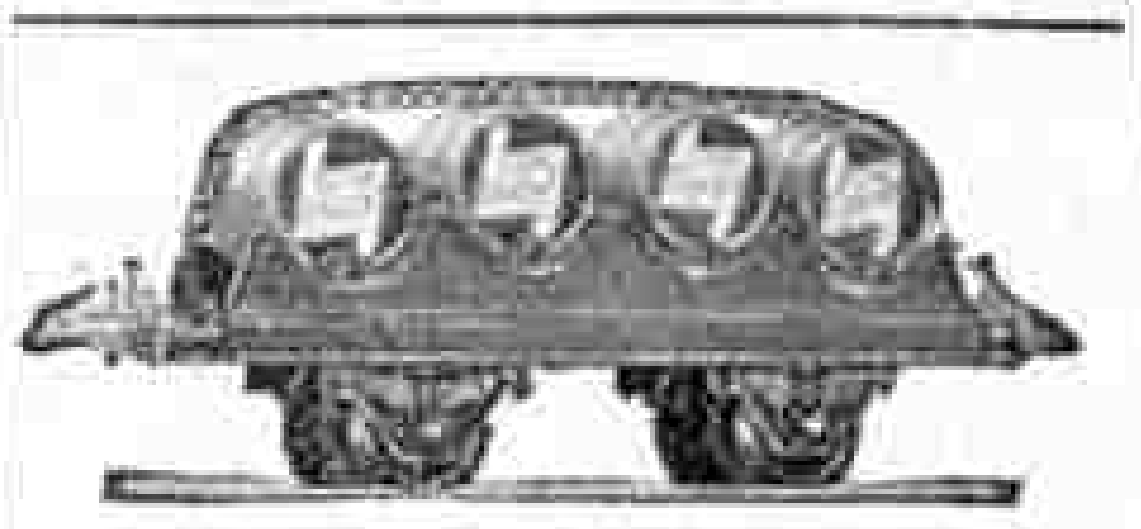

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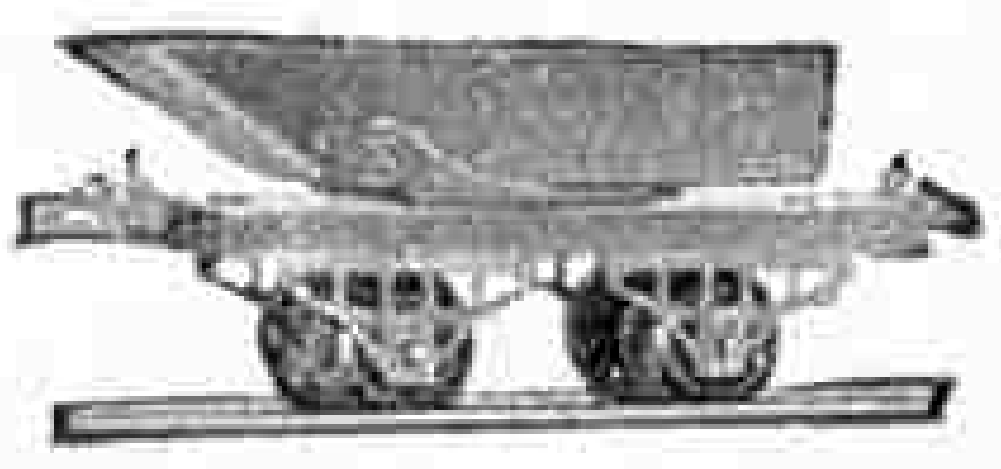
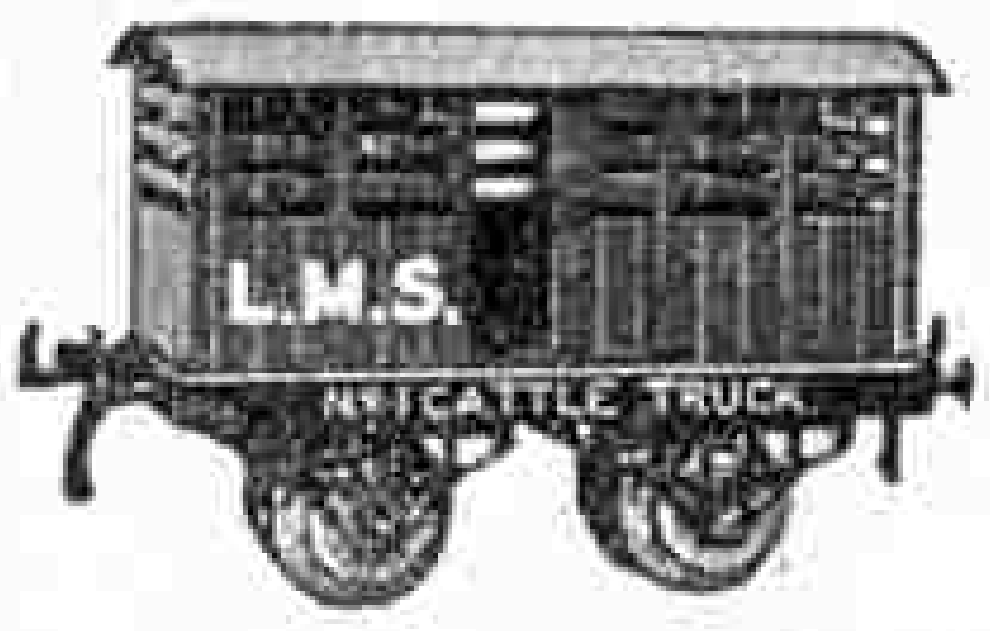


No. 0 ROTARY TIPPING WAGON
Price **1/6**



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Fitted with sliding doors. Very realistic design.
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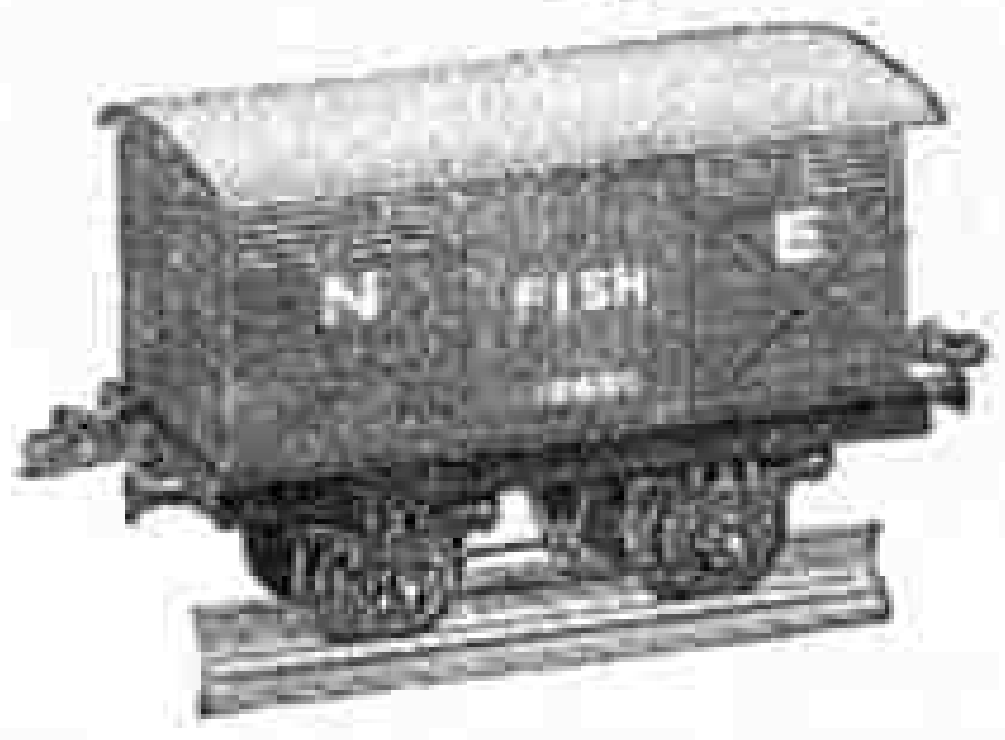

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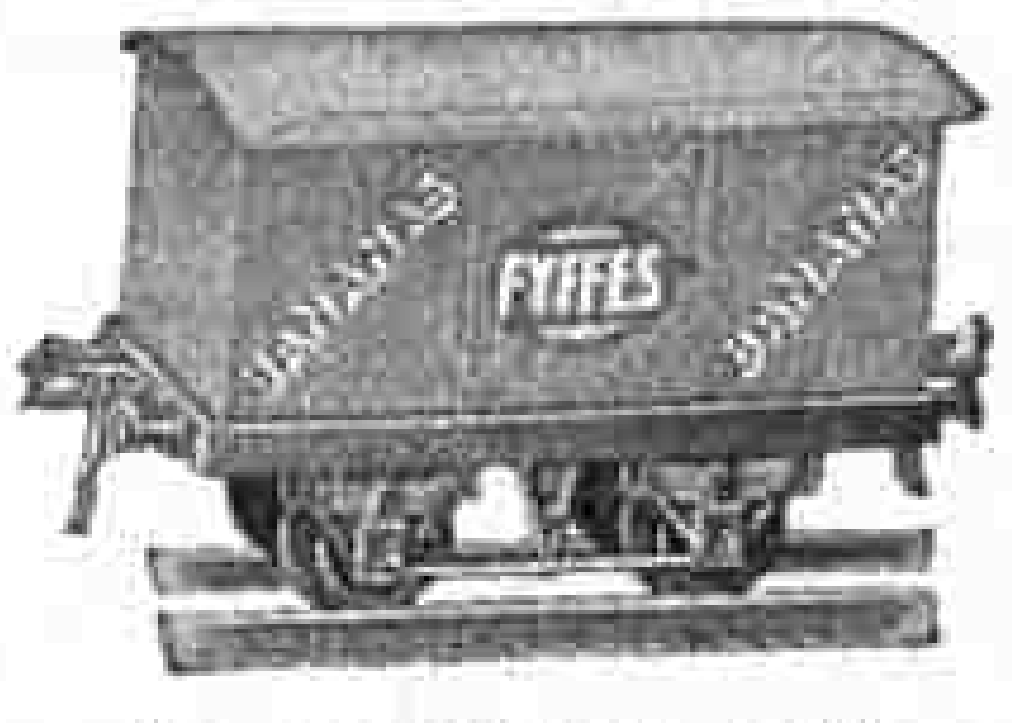

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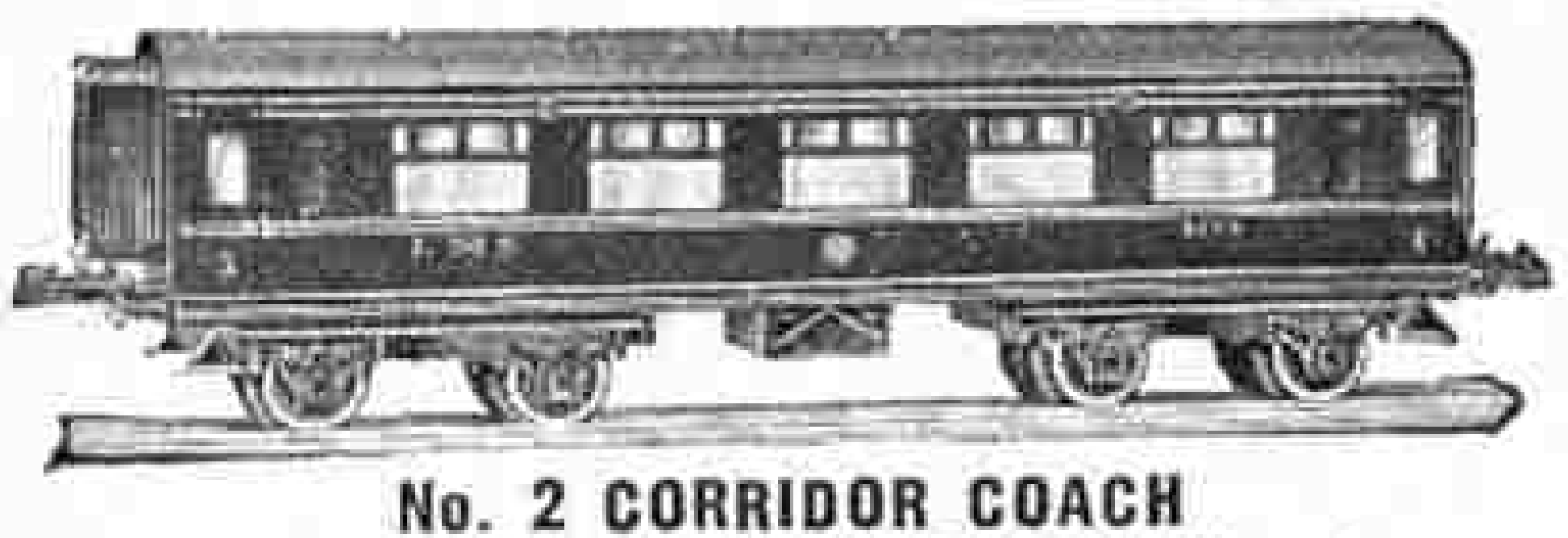

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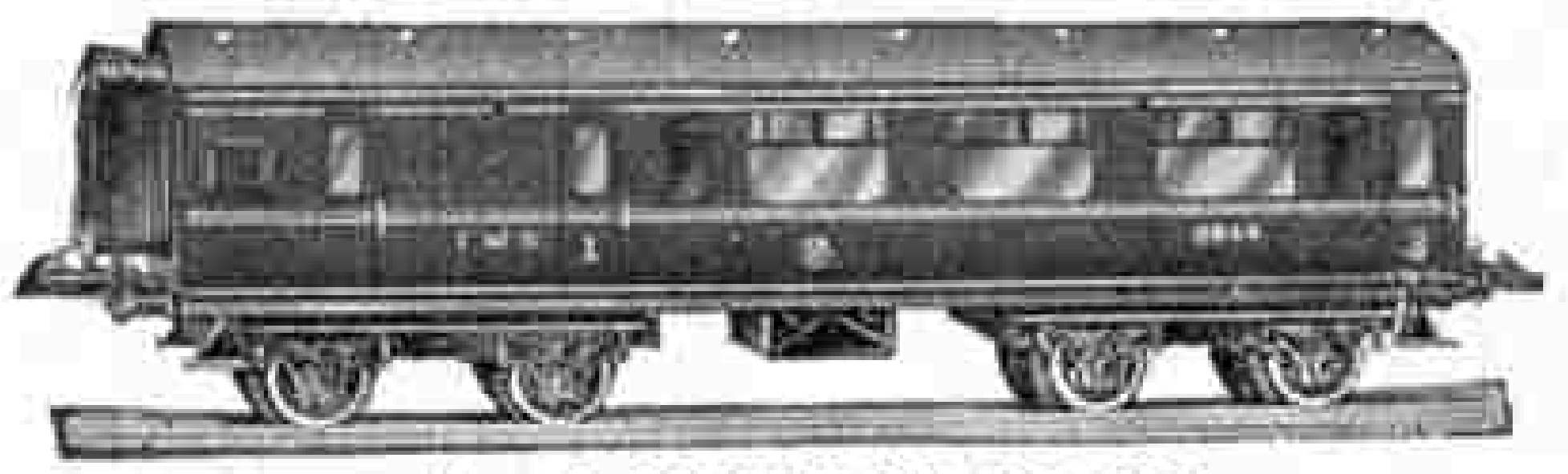

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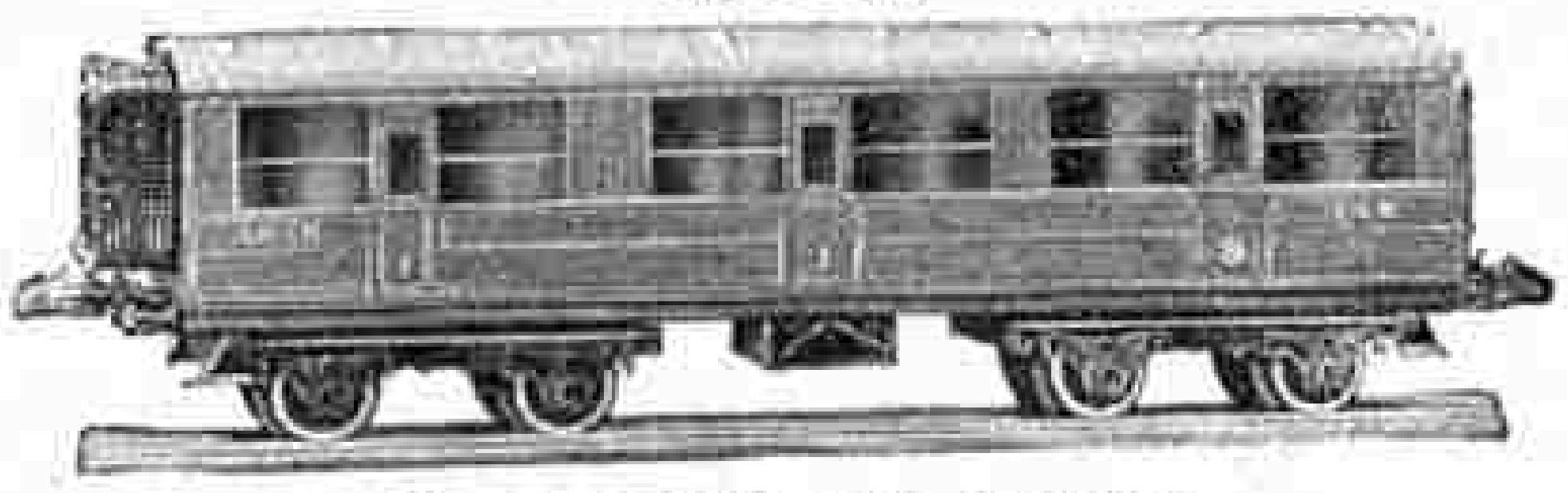

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L.N.E.R. First-third. For 2 ft. Radius Rails only.
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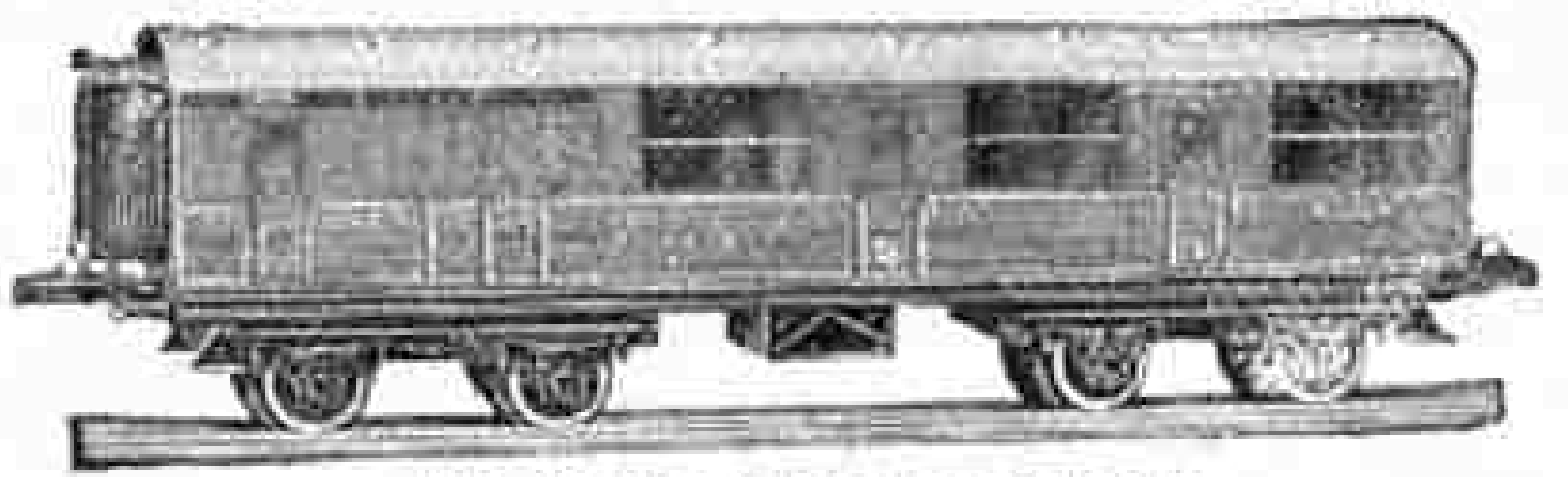

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L.N.E.R. Brake composite. For 2 ft. Radius Rails only.
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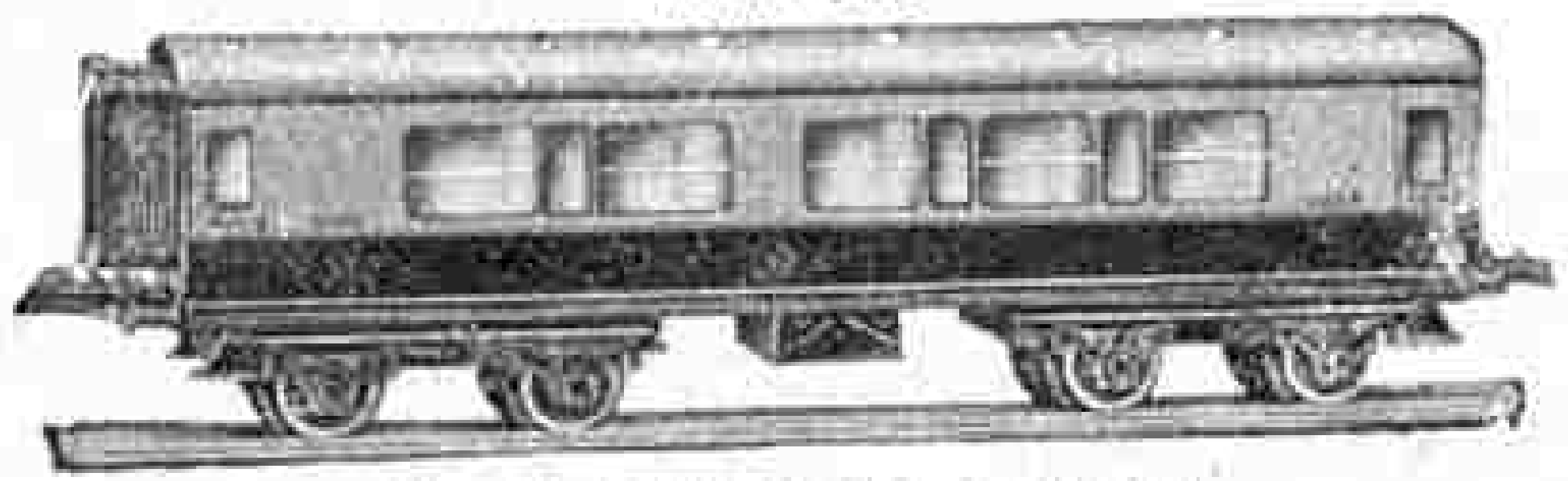

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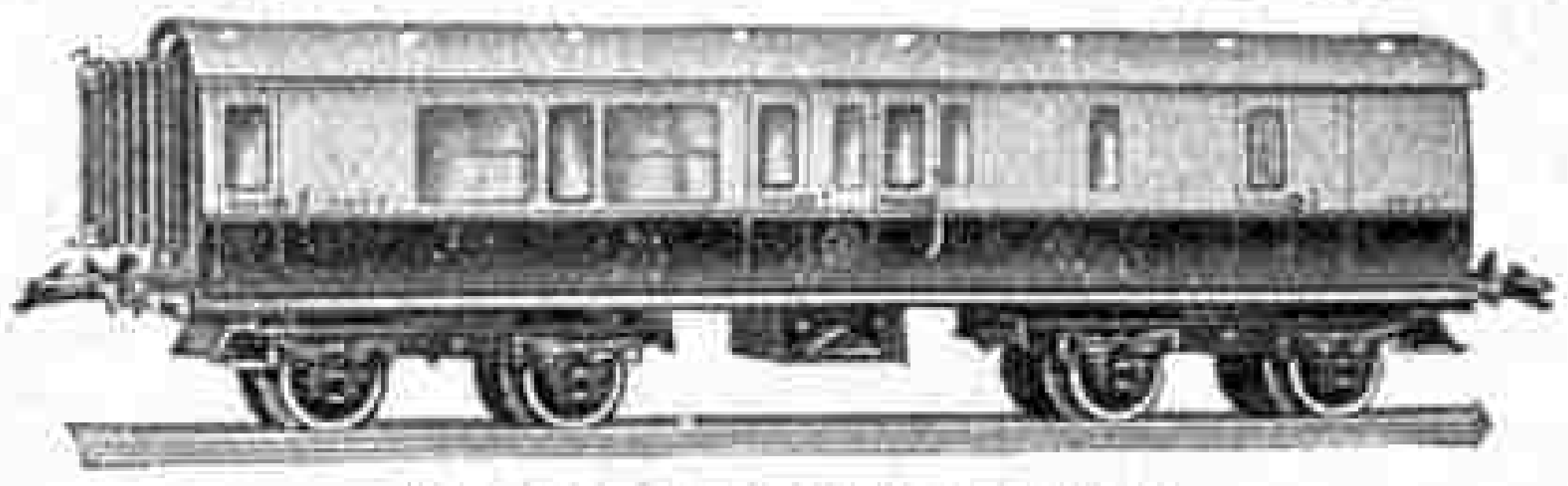

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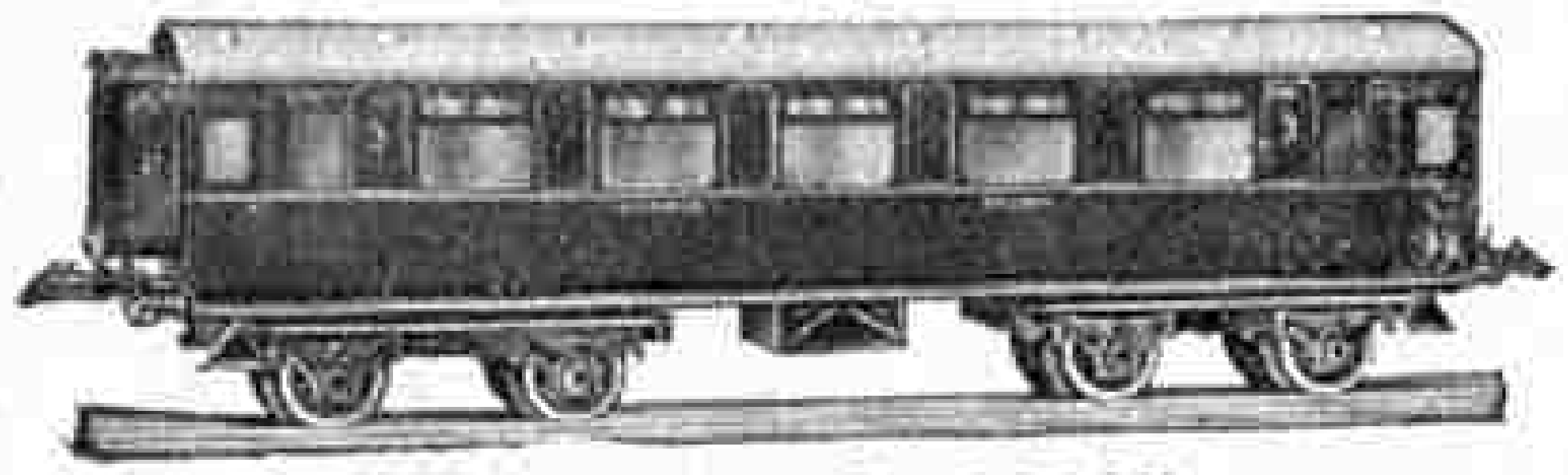
G.W. Brake composite. For 2 ft. Radius Rails only.
Price **7/6**



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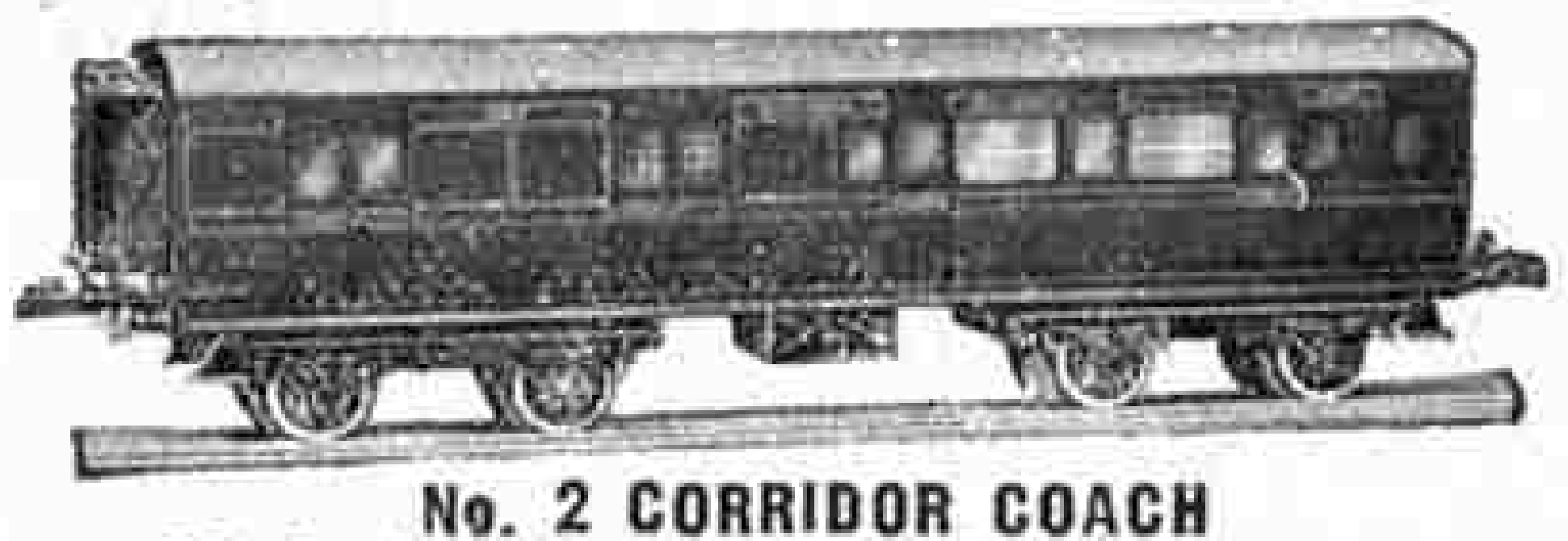
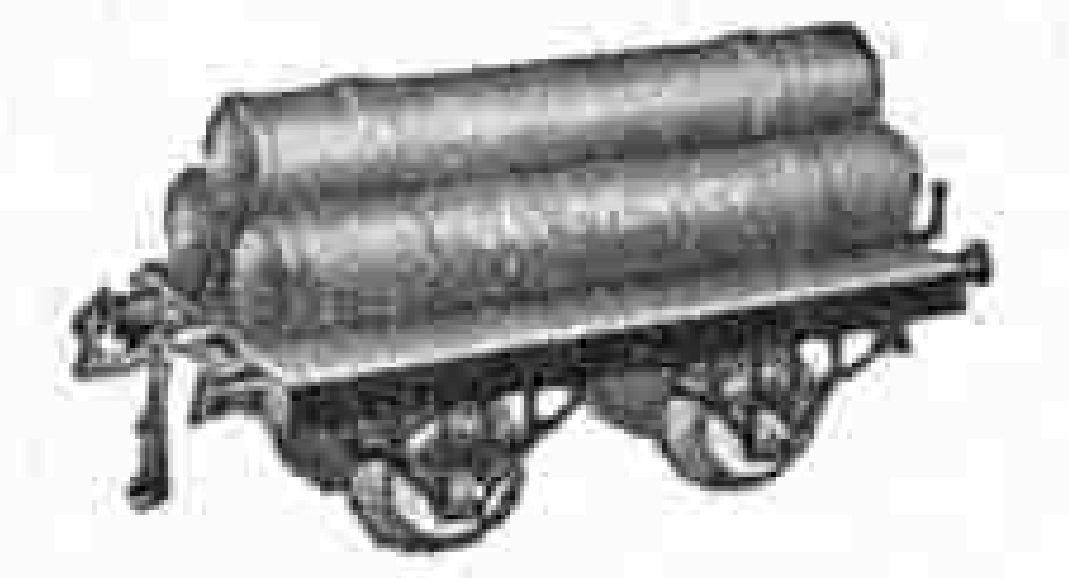
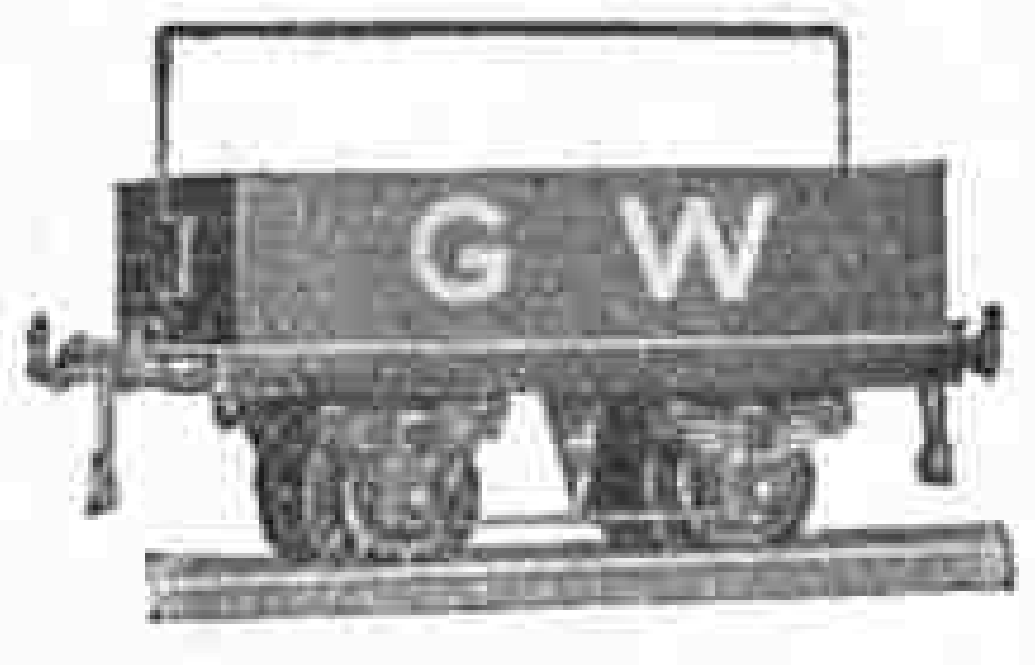


No. 2 CORRIDOR COACH
S.R. Brake composite. For 2 ft. Radius Rails only.
Price **7/6**



GAS CYLINDER WAGON
Finished in red. Lettered gold.
Price **1/8**



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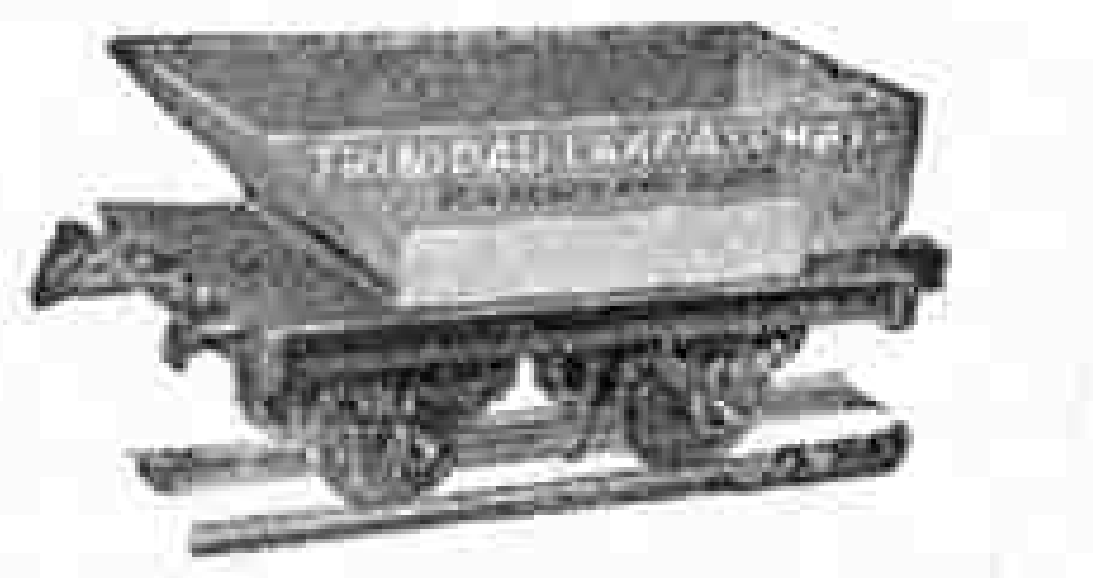
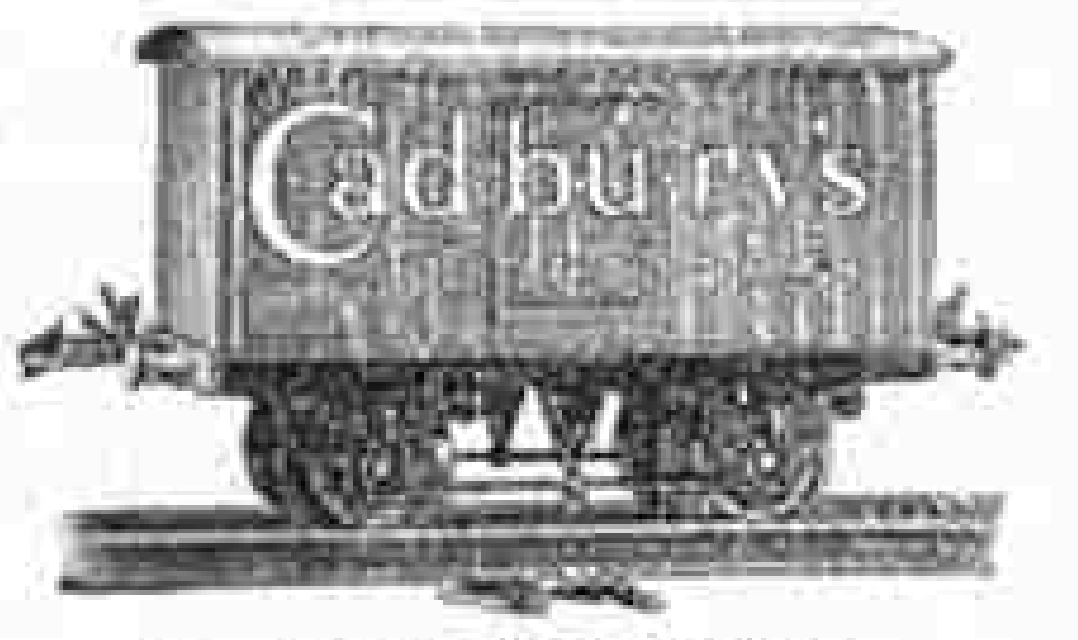
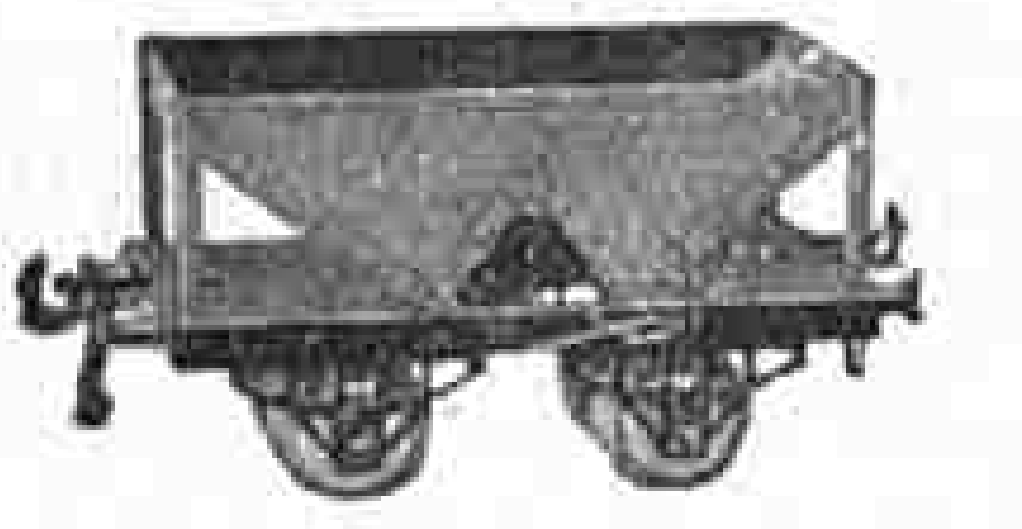


No. 1 ROTARY TIPPING WAGON
Finished in orange.
Price **2/-**



CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof.
Price **2/3**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/-**

MILK TANK WAGON "NESTLE'S MILK"
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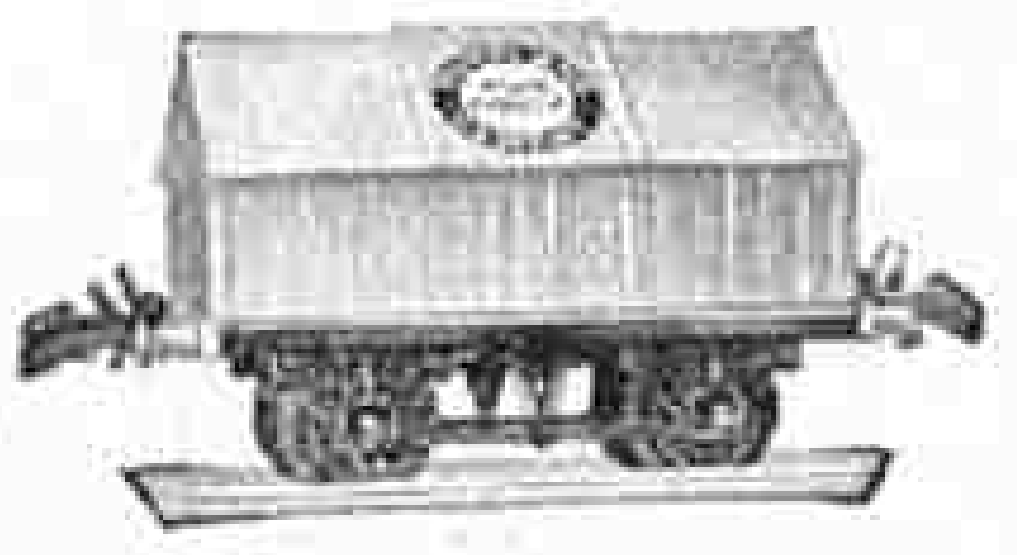

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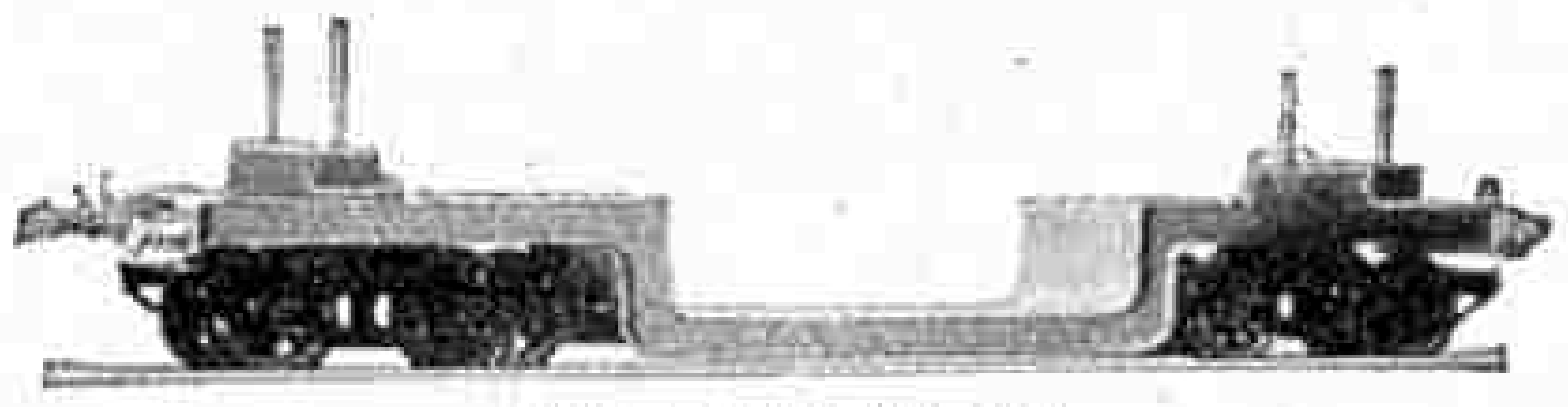
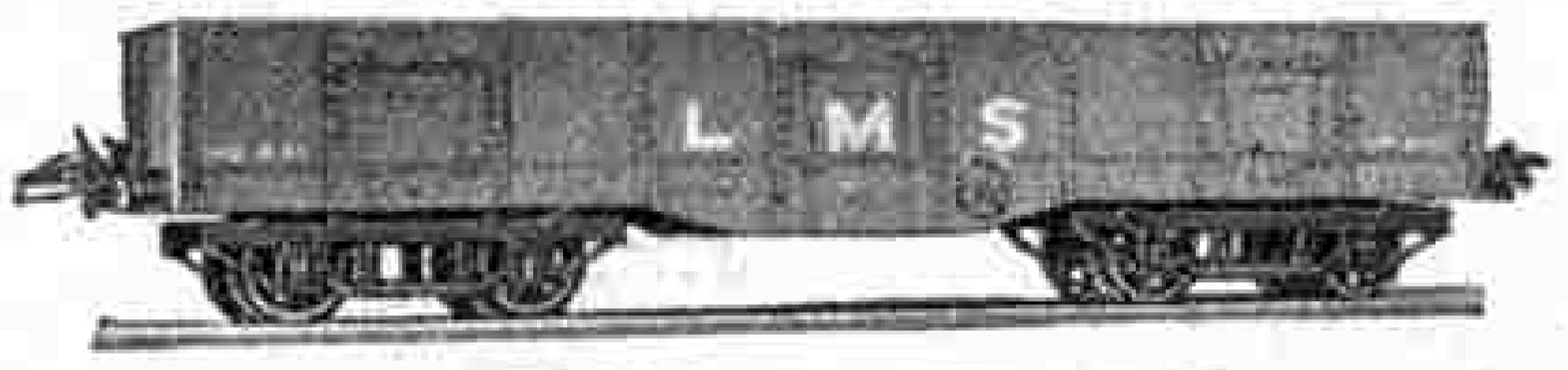


TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **4/-**



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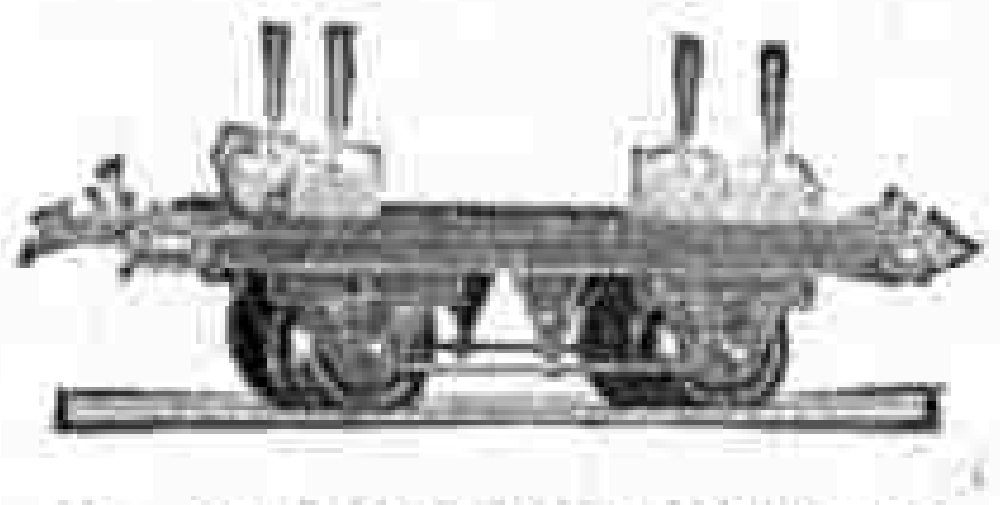
COAL WAGON
Fitted with embossed representation of coal. Price **2/3**



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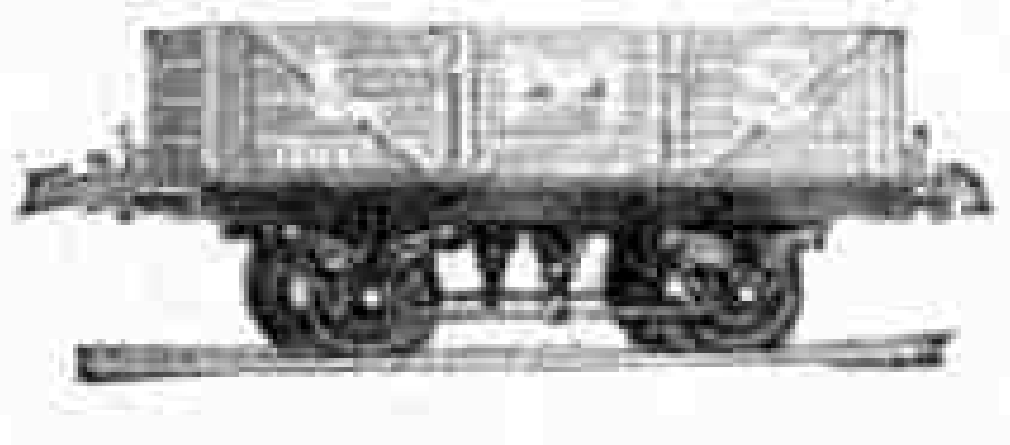
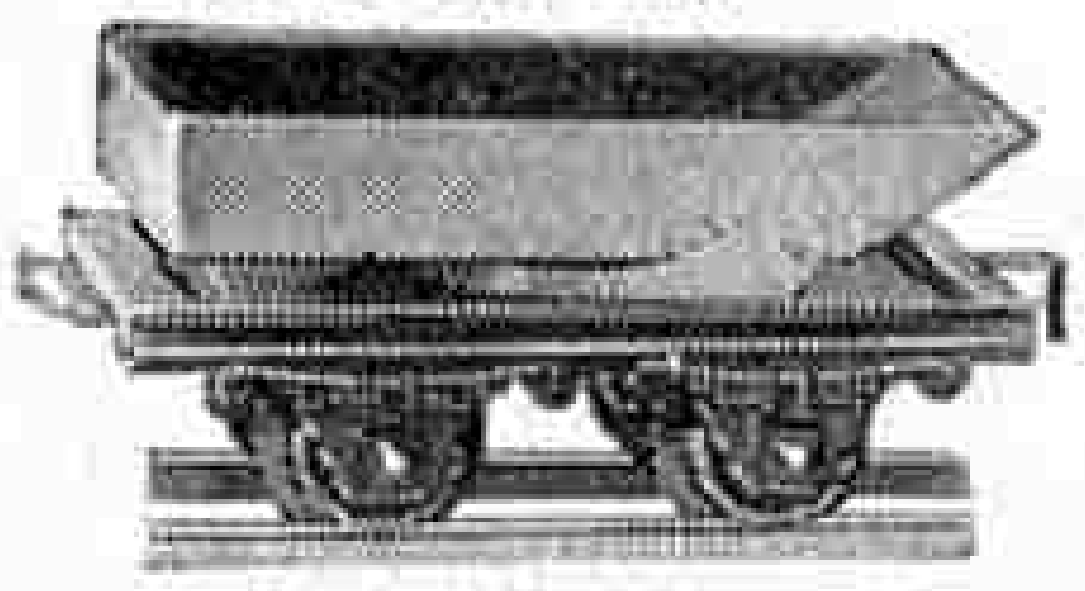


***No. 0 WAGON**
Price **1/3**



MO ROTARY TIPPING WAGON
Price **1/-**

No. 1 CRANE TRUCK
Finished in brown and blue.
Price **2/9**

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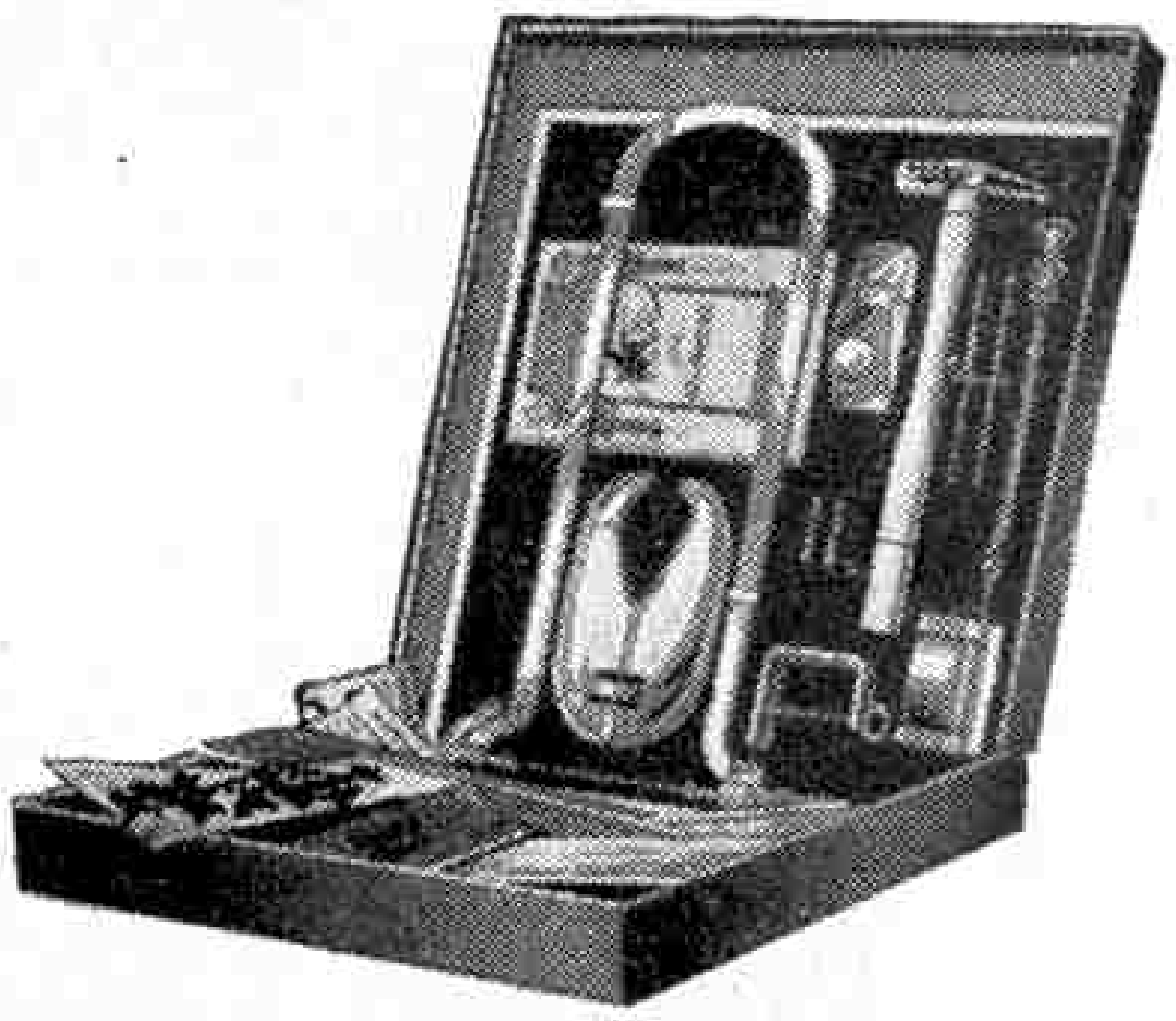

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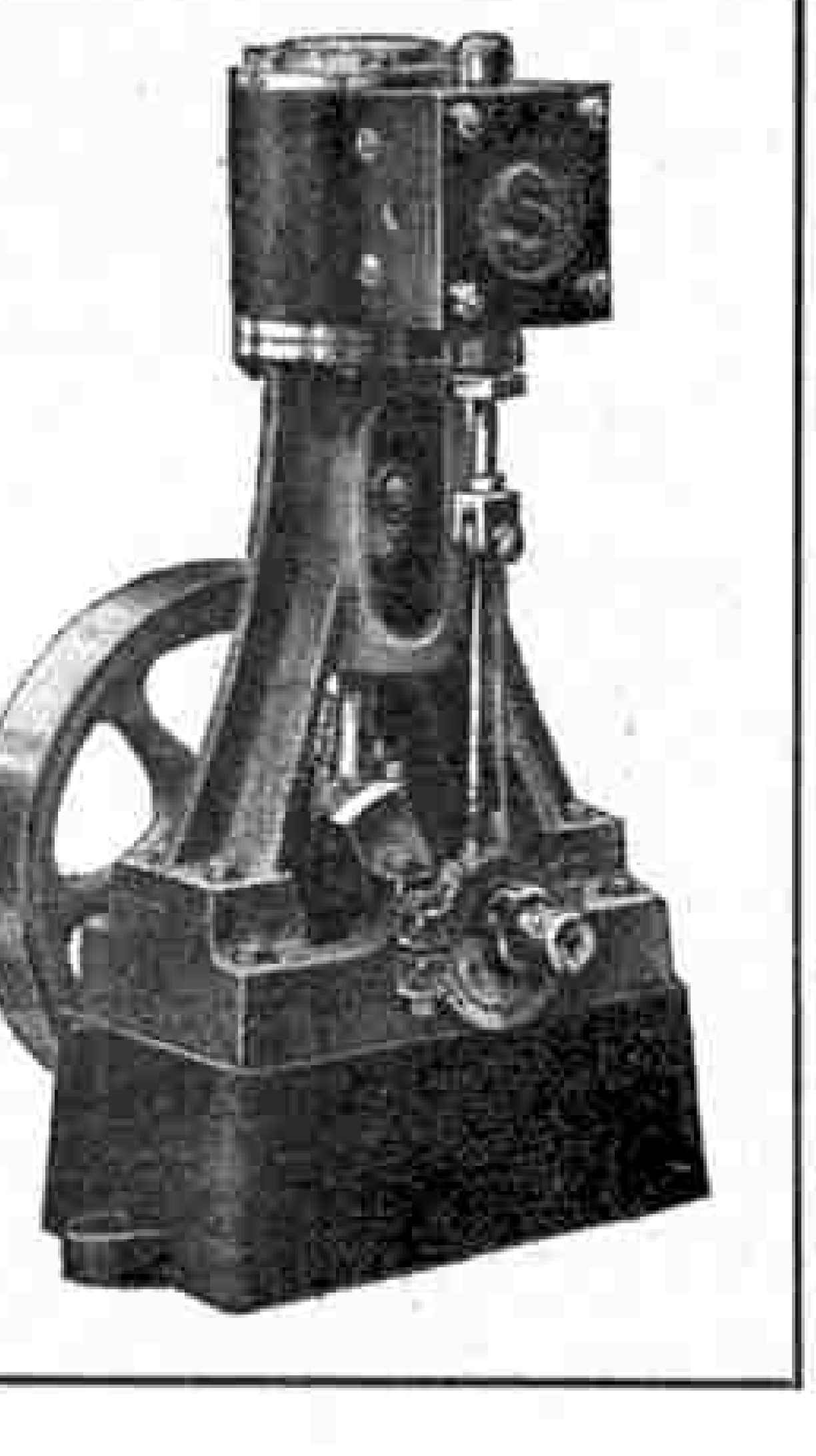

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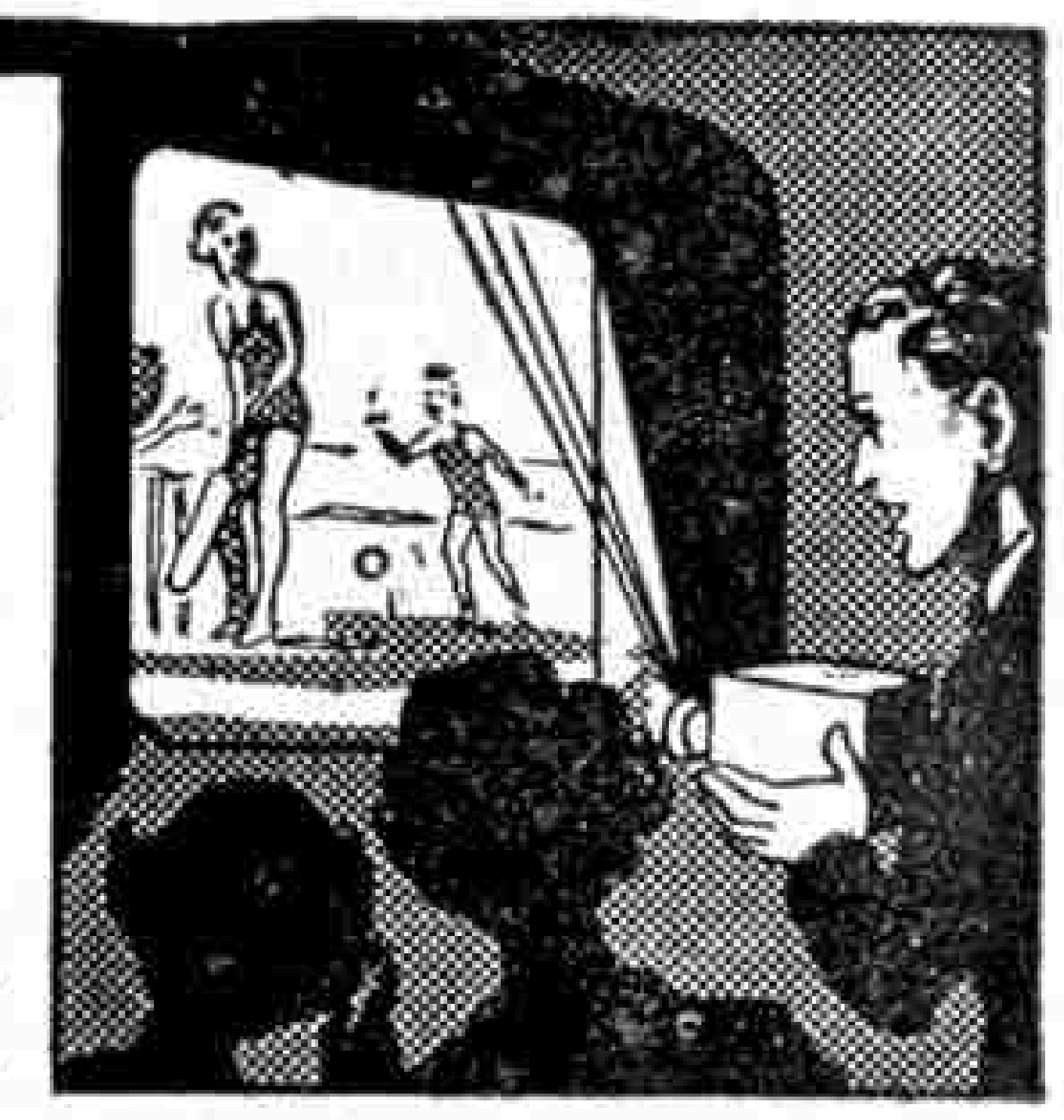

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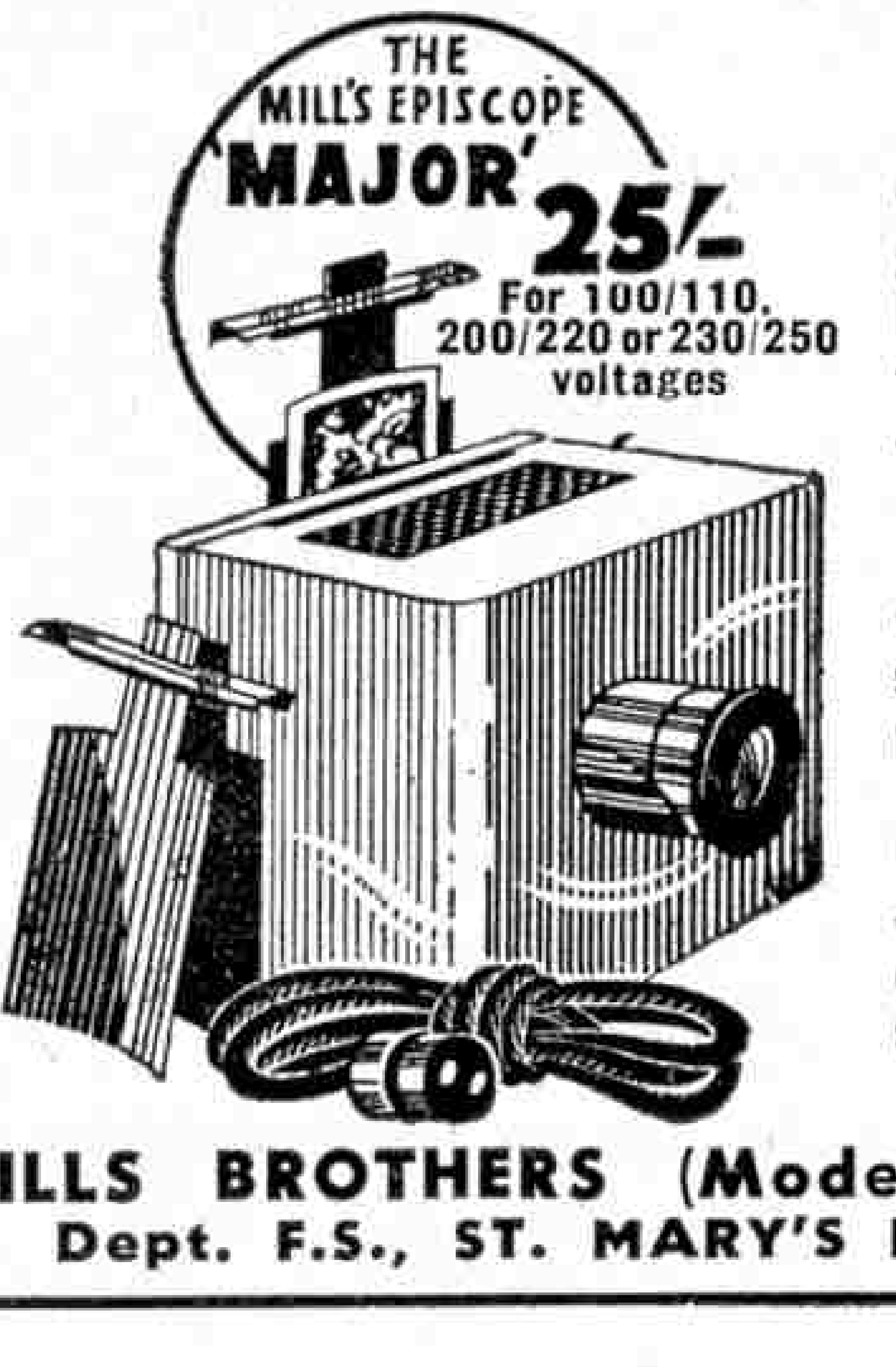

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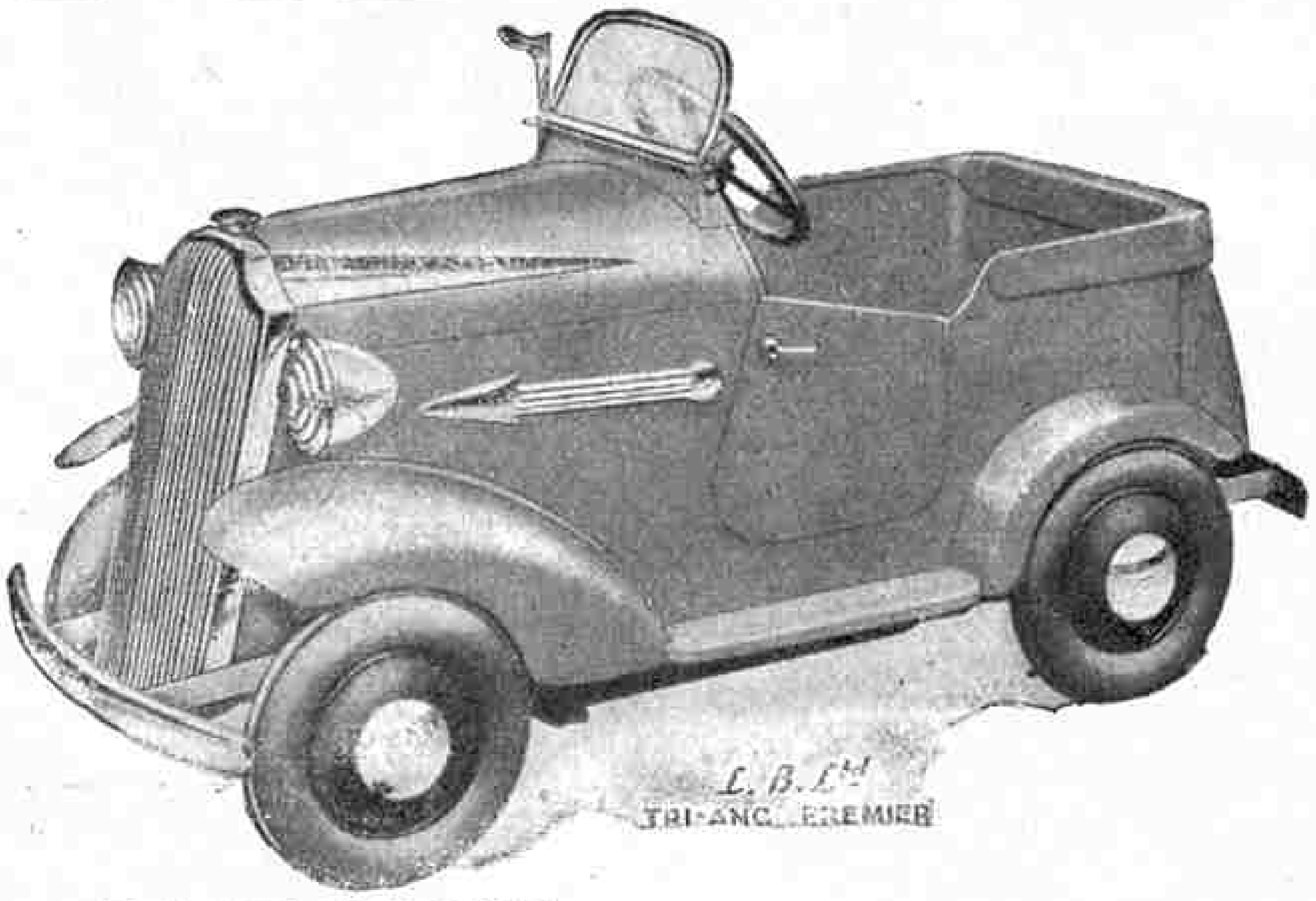
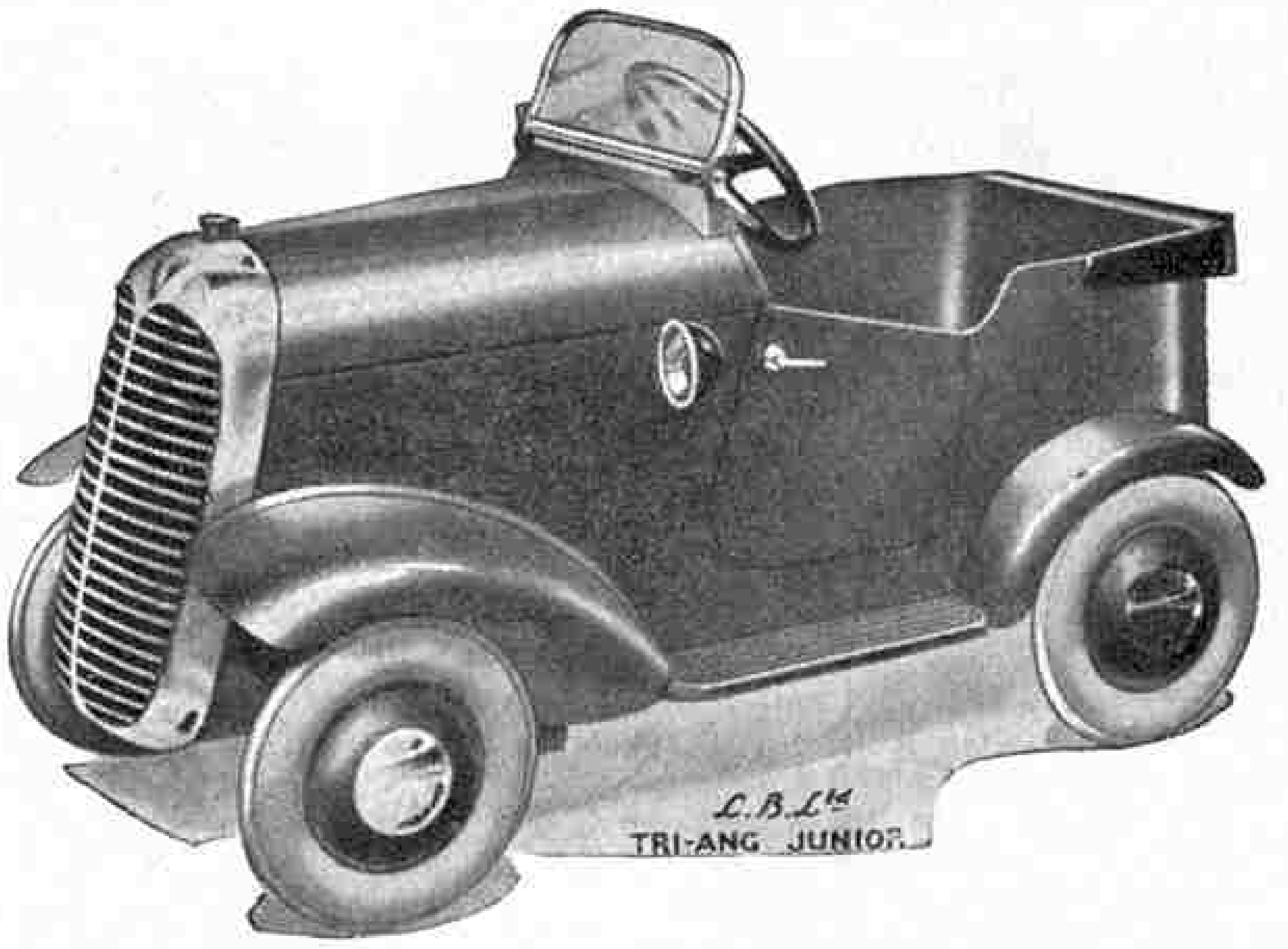


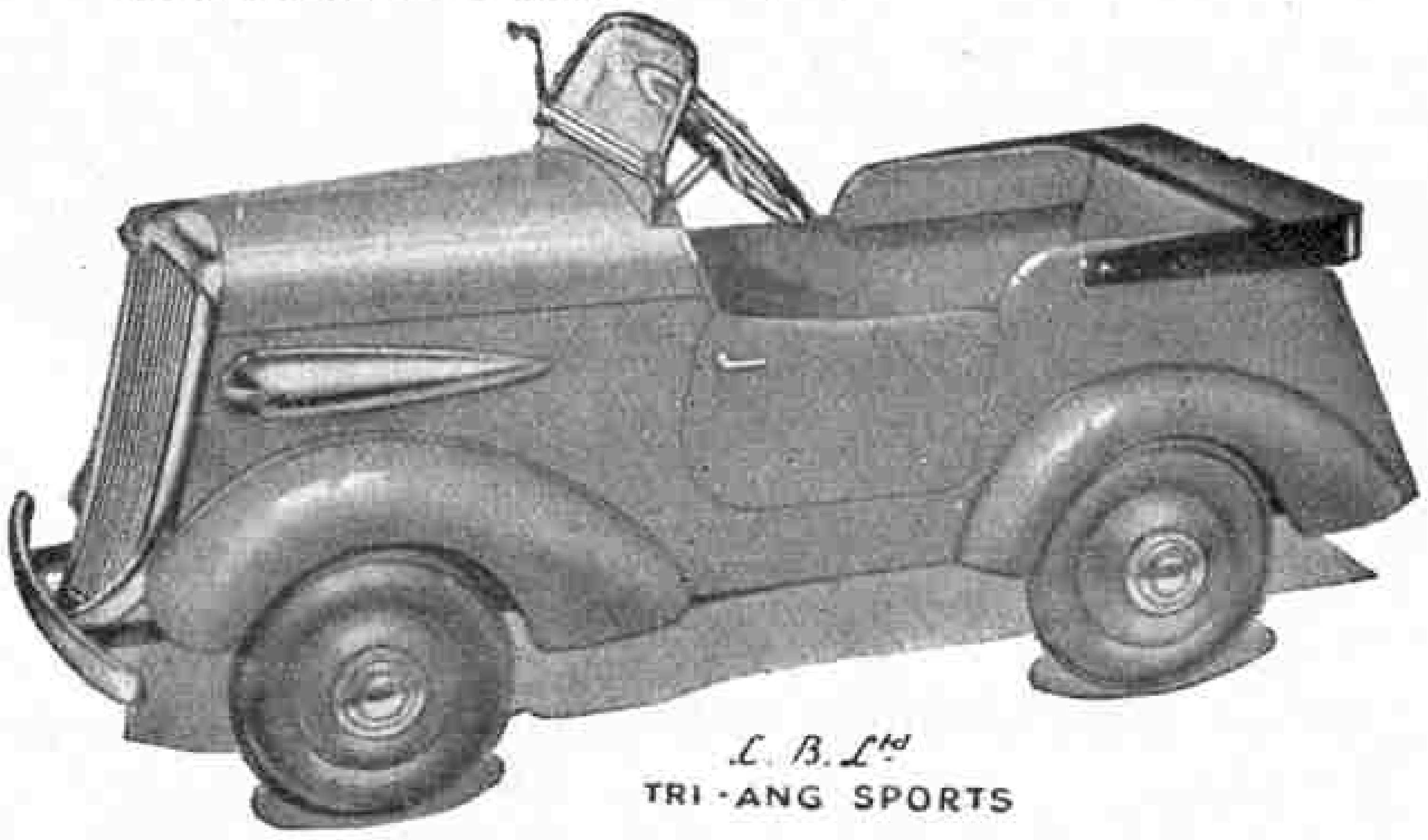
TRI-ANG PREMIER

Super Children's Car. All-steel body. Latest type Vauxhall radiator, lamps and bumpers. 8 in. balloon disc wheels. ½ in. rubber tyres. BALL-BEARING BACK AXLE. Windscreen and direction indicator. Dummy hood. All bright parts CHROMIUM-PLATED. Length 39 in.



TRI-ANG JUNIOR

Realistic Sports Car. All-steel body. Opening side door. Plated streamline radiator. Two dummy side lamps. 8 in. balloon disc wheels. ½ in. rubber tyres. Equipment includes petrol and oil cans. Length 34 in.



TRI-ANG SPORTS

Realistic streamlined model, with opening side door and luggage boot. 8 in. balloon disc wheels. ½ in. rubber tyres. Ball-bearing back axle. Plated bumper and streamline dummy side lamps. Windscreen, direction indicator and dummy hood. Length 41 in.

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Cycle chain drive with free-wheel. Frame best quality weldless cycle tubing. 14 in. wheels. 1⅜ in. jointless sponge-rubber tyres. Improved handlebars. Rim brake. Coil-spring saddle. CHROMIUM-PLATED FITTINGS. Black, blue or maroon.

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NEXT MONTH: "THE FIRST ATLANTIC STEAMSHIP CROSSING." PUBLISHING DATE: 1st MARCH.

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

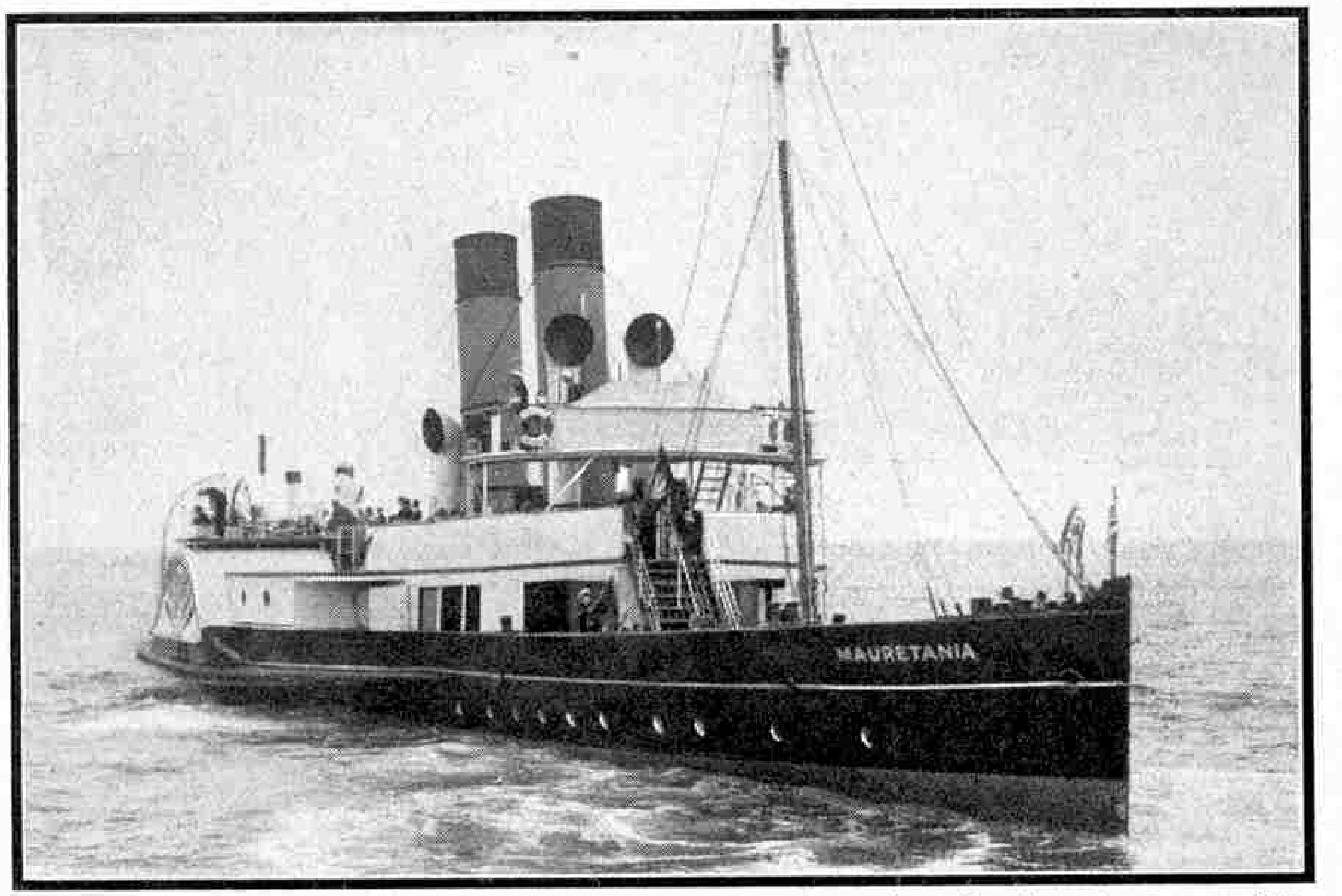
Vol. XXIII. No. 2
February, 1938

With the Editor

Where Does the Wind Go?

During last month a terrific storm broke over the greater part of the British Isles. The storm raged with especial fury on the west coast, and on Merseyside, the home of the *"Meccano Magazine,"* sleep was difficult all through the night of Friday, 14th January, because of the howling of the wind and the clatter of slates torn from roofs. Yet on the very next night the air was so still and quiet that it was hard to believe that it had ever been in motion at all, much less stirred up to such a frenzy. The wind came, raged for a while, and then departed. Where did it go?

"The wind bloweth where it listeth," and looking for it is very much like looking for the foot of the rainbow. This is certainly the case in our own country, where we get samples rather than real weather. In certain parts of the world the winds are more reliable, even if they are more violent, and next month I hope to include an article on this elusive and interesting subject.



The pleasure steamer "Mauretania" which carries this famous name under a "gentleman's agreement" to hand it back to the Cunard White Star Line when called upon. Photograph by K. W. Green, Rock Ferry.

The Famous Name *"Mauretania"*

When the *"Mauretania"* is mentioned we think at once of the famous Cunard White Star liner, the proud holder for nearly 21 years of the Blue Riband of the Atlantic crossing, and now, alas, broken up. To many of my readers it will therefore be a great surprise to find that the vessel shown in the illustration on this page bears this famous name.

The explanation of this is simple. When the old *"Mauretania"* was withdrawn from service and broken up, an arrangement was made with the Southampton–Isle of Wight Steam Packet Company to change the name of their 365-ton paddle steamer, *"The Queen,"* to *"Mauretania."* Thus, although the great Transatlantic liner has gone, it has been possible since her break-up to travel in another *"Mauretania,"* but only on trips along the coasts of Hampshire and Dorset at fares of a shilling or two.

The change was made in order to keep control of the name, which will be given back again when required by the Cunard White Star Line. This will be soon, for a new liner now being built for the Company by Cammell Laird and Company Ltd., Birkenhead, will be named *"Mauretania"* when she is launched on 28th July. What the third vessel of this name will look like is shown in the illustration on page 81 of this issue, on which is an article giving details of this vessel.

Next Month

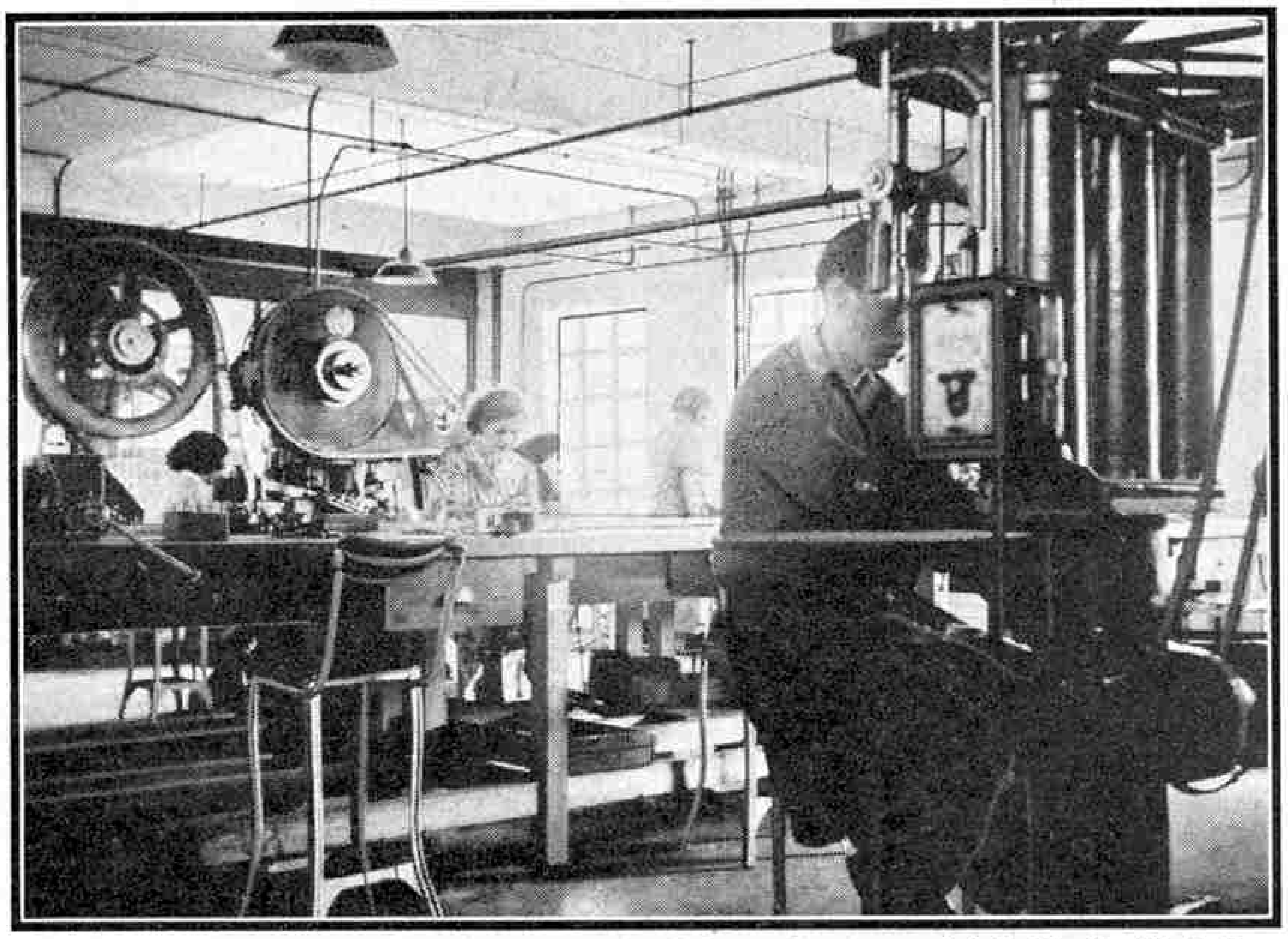
The first 100 years in the story of the Atlantic crossing by steam comes to an end during March. As is so often the case where great events are concerned, there was keen rivalry to achieve the first crossing of this kind. The honour actually fell to the *"Sirius,"* but she reached New York only a few hours ahead of the *"Great Western,"* belonging to another company. The story of this wonderful race will be told in next month's issue, and an interesting contrast to the position 100 years ago will be provided by an account of the Dornier flying boats now used on the regular D.L.H. air mail service across the South Atlantic.

The March issue will include an attractive article on the making of K.L.G. sparking plugs. There also will be special railway contributions. One will deal with the interesting Somerset and Dorset Joint Railway and the run over it of *"The Pines Express."* Another will describe a footplate trip over the difficult L.N.E.R. line from Glasgow to Fort William, the long steep banks and sharp curves of which call for stern locomotive work, *HOW THINGS ARE MADE:*

Electricity Meters

Accurate Work in Machine Shop and Test Room

AN electricity meter is a very interesting mechanism, yet few people have ever had the opportunity of seeing what its interior is really like. Most are familiar with the dials behind its glass door, over which pointers rotate unceasingly, some of them clockwise and others in the opposite direction, while electricity is being used; and those who have examined their meters more carefully will have noticed a thin disc below the dials that also is continuously in motion when current is being used. The disc is polished, and is so well balanced that it is difficult to see whether it is rotating or not unless the special mark on the rim is noticed.


The machine shop at the Hendon works of Rex Meters Ltd., to whom we are indebted for the illustrations to this article. In this department meter parts are made with the aid of presses, automatic lathes and grinding, milling, tapping and drilling machines.

Apart from its interest to those who have to pay for the current that it measures, a meter is a very attractive example of the electrical engineer's skill in design. It is not sufficiently realised that a meter is a very delicate piece of apparatus that is expected to run for 10 years or more without receiving any attention whatever, and to remain accurate within very fine limits throughout that period. Thus it must be of robust construction, capable of working automatically whenever it is called upon to do so by the switching on of lights, fires or other appliances, the current for which flows through its windings. Moreover it must be equally reliable when only a very small current is passing, and when it is working up to the full load for which it is designed.

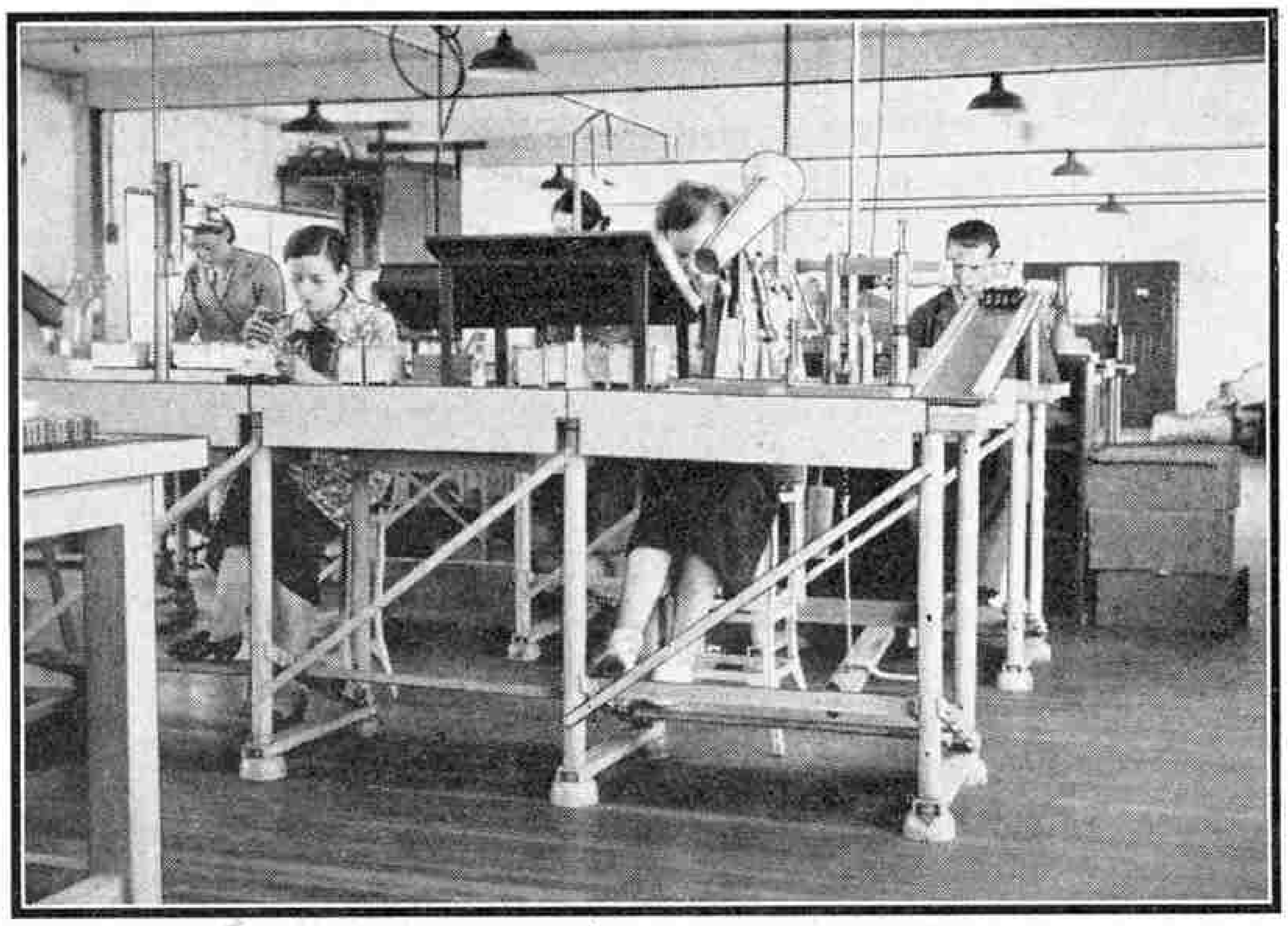
As current supplies are now almost universally alternating, and A.C. is becoming standard, it is the A.C. meter that is of the greatest interest. All these meters, whatever voltage and strength of current they are designed to work with, are built up on the same principle, their general constructional details being similar as far as the electrical part is concerned. Two electro-magnets are used, mounted one above the other with a small gap left between them, and the windings of these are connected to the mains passing into the meter. An aluminium disc on a vertical spindle is so arranged that its rim passes through the gap. One of the two coils, known as the "pressure coil," consists of a large number of turns of very fine wire, and offers a high resistance to the passage of the current. The second coil is made up of a few windings of thick wire, the electrical resistance of which is almost negligible. The exact number of windings in the two coils and the gauge of the wire used for them are varied as required to suit the particular conditions for which the meter is required.

The disc mounted with its rim in the gap between the coils rotates constantly when current is passing through the meter, although it is not connected with them in any way. Its movement is due to electro-magnetic "fluxes" passing from the core of one coil to the core of the other. The spindle of the disc is mounted on a jewel bearing, and on it is fixed a worm gear that is in mesh with a toothed wheel, which in turn drives the counting train through suitable gearing. The spindles of the wheels of the counting train carry also the pointers that rotate in front of the meter dial. The gearing is so arranged that the readings of the pointers on the dials give the consumption in kilowatt-hours, the recognised unit for charging purposes.

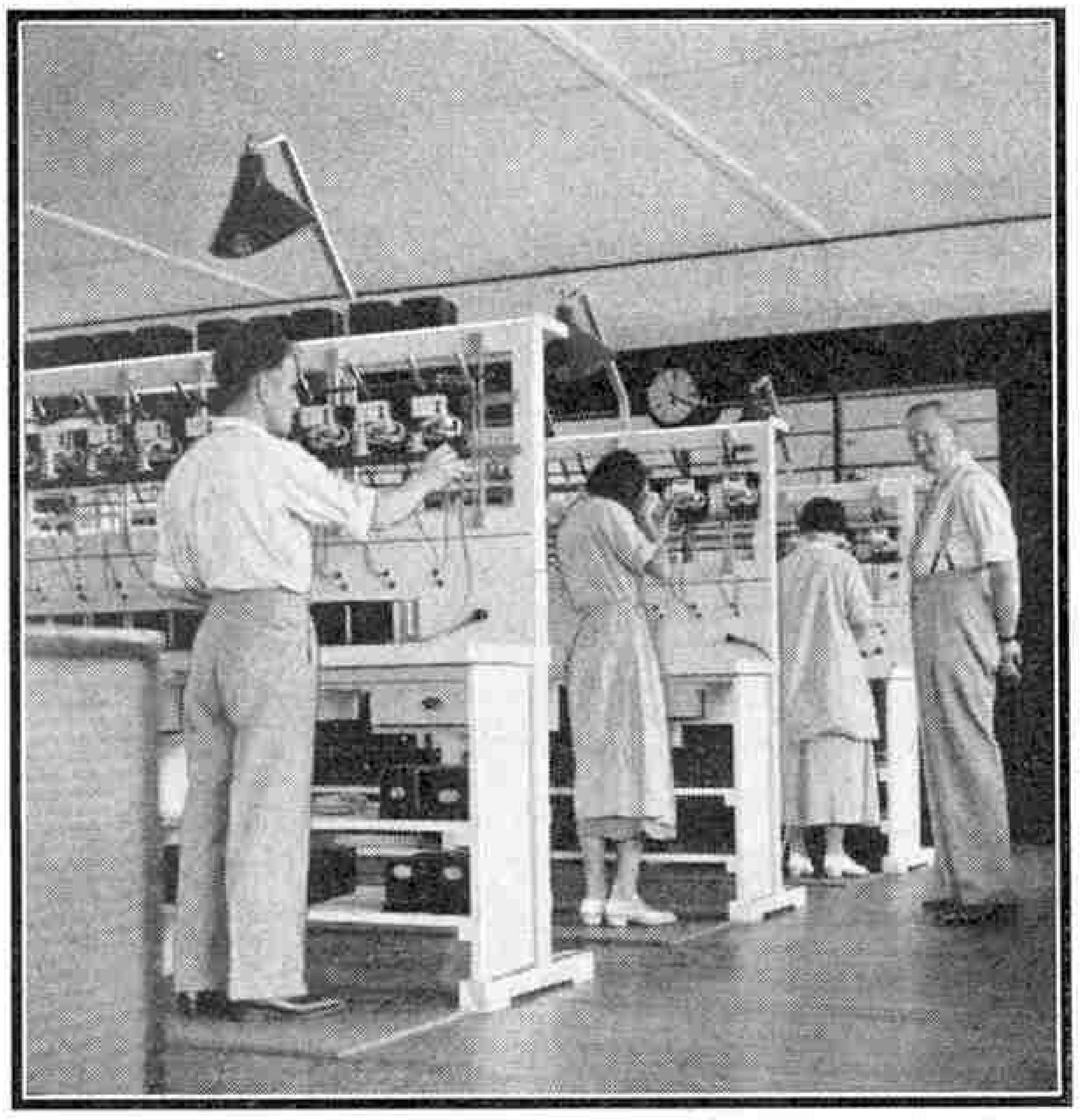
The metal cores on which the coils are mounted are made up of laminations stamped to the required shape by powerful presses, and then tightly pressed together. A magnetic brake is employed in order to prevent the disc from rotating too fast. The rim of the disc passes through the opening between the poles of a permanent magnet of the horse-shoe type, which gives a very smooth and constant braking effect by producing eddy currents in the disc. The accuracy of the meter depends very largely on the fact that this brake magnet keeps its strength absolutely constant.

Electricity meters can now be supplied in cases of metal or bakelite. The most modern types of the latter, such as that of the house service meter made by Rex Meters Ltd., Hendon, are made without projecting lugs to break off, the fixing screws being fitted into recesses in the cover and base. Strengthening ribs make sure that there is no distortion to disturb the accuracy of the instrument, and the main frame provides a rigid support for the meter element, which can easily be removed for inspection purposes. This element is accurate within limits of 2 per cent. above or below the exact measure, even when the meter is overloaded to the extent of a quarter of its designed capacity.

One of the chief points to be observed in the manufacture of electricity meters is that everything must be kept absolutely clean and free from dust throughout the various processes between the arrival of the raw materials and the packing of the finished meter. Rex Meters Ltd. have solved this problem in a striking manner at their new Hendon works, which are equipped with very modern machinery and testing plant. The building has two floors, the lower of which contains the offices, stores for raw and finished materials, and the machine press, stoving and spraying shops. On the second floor are the assembly shop and a large test-room. The building is very well lighted, and all machines and presses have individual drive, that is they are driven by electric motors incorporated in them or directly geared to them, and thus there are no belts.


Work in progress in the assembly room. On the table in the foreground is a dial-meshing machine in which the operator sees the gear wheels magnified about 30 times.

In the well-planned machine shop, part of which is shown in the illustration opposite, are the grinding, milling, tapping and drilling machines. Automatic lathes for producing small turned parts, and the machines on which the coils are wound, also are placed in the machine shop, which contains a high temperature gas furnace for hardening and heat-treating small tools. In the press shop are a number of presses of the latest type, fitted with most efficient safety devices, which make it practically impossible for an operator to receive injury while working on them, for his arm would be quickly dragged out of harm's way before the die of the press could come down.


Testing electricity meters. Each bench takes 25 instruments, the discs of which are started and stopped at the same time as that of the standard meter with which they are compared.

In the spraying shop is a degreasing plant, in which parts to be painted are treated with solvents in order to remove all traces of oil and grease. The painting is carried out in a very cleverly designed spray-booth, in which all vaporised paint is immediately sucked away by a special system of air circulation and taken outside the building by means of a powerful fan. In the paint shop there is also a large gas-heated drying oven, with automatic heating control, for stoving the freshly painted parts.

It is in the assembly shop on the first floor that the meter parts first come together. They are assembled by highly-trained workers, and as many processes as possible are carried out on the conveyor system, as in nearly all modern works. In this case no actual conveyor is employed, however. As the component parts of the meter are assembled, they are deftly passed on from hand to hand, each process being accomplished in exactly predetermined time.

Some very ingenious machines are in use in the assembly shop. For instance pneumatic screwdrivers are used for inserting screws into terminals at astonishing speed. A dust extractor thoroughly cleans out the meters before they are passed on to the next department, and an apparatus is employed by which the gears in the counting train are highly magnified, so that their mesh may be controlled with extreme accuracy. The vital parts of the meter, such as the jewels and pivots, are microscopically examined for flaws and dust.

From the assembly shop the meters pass to the test room, which is probably the most interesting part of the works. The testing plant consists of an automatic regulator that keeps the testing voltage absolutely constant, a special "standard" test board for checking up the standard meters, and the main test benches, each of which is fitted with a device for starting and stopping the meter discs at exactly the same time. Special dial tests are carried out on a separate board.

The actual testing of the meters is done by comparing the new meters with a very accurate standard meter. On the rim of each meter disc is a mark about ½ in. wide, and all the meters on each test bench are set with the marks on their discs in the same position as the mark on the standard meter. The test current is then switched on, and all the discs rotate, more or less together. After the disc of the standard meter has made a certain number of revolutions, the current is switched off. The marks on the discs of the meters under test do not keep step with that of the standard meter. Some go ahead, and others lag behind. The meters are then regulated as required, and this process is repeated until finally all the discs rotate at the same speed, that is all the marks come round together.

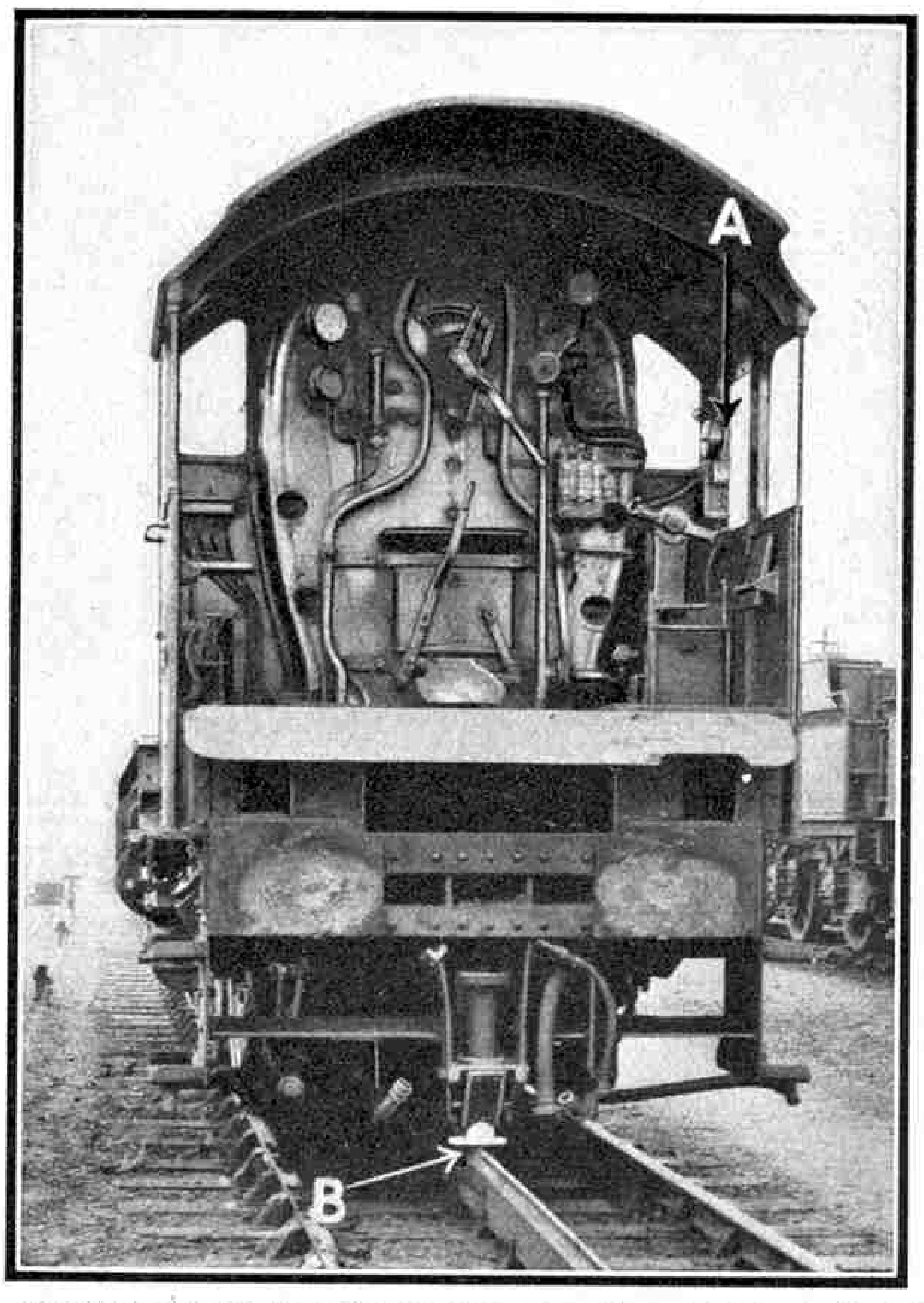
Every possible kind of load to which a meter can be subjected can be reproduced on the test board, and no meter is allowed to leave the works until it has undergone a very severe trial to determine its accuracy on all loads.

For the information in this article we are indebted to Rex Meters Ltd., Hendon.

G.W.R. Automatic Train Control

"Safety First" on all Main Line Routes

THE wonderful safety record of British railways is a great tribute to the splendid signalling system in use in this country, and also to the reliability of the railwayman himself. Railwaymen are never satisfied with what they have already done in this direction, however, and are always striving to make travel safer. With this end in view various schemes of automatic train control have been evolved in order to avoid the possibility of accident due to human forgetfulness or error. A good example of the devices they have introduced is the lineside tripping mechanism of the London Passenger Transport Board, which cuts off current and applies the brakes if a train attempts to over-run a danger signal.



The cab of a G.W.R. locomotive fitted for automatic control. The electric bell apparatus is shown at A, and at B the special shoe on the engine is seen in contact with the ramp between the running rails.

Many systems of automatic train control for steam trains have been tried from time to time by the different railway companies. The only one that has been consistently applied in this country, however, is that developed by the G.W.R. This is now in operation on some 2,600 miles of G.W.R. line between Paddington, Plymouth, Fishguard and Shrewsbury, and there is little doubt that the remarkable immunity of the G.W.R. from serious mishap over a long period of years is due to the efficiency of their system.

Automatic train control on the G.W.R. was first installed experimentally on the Henley branch, and later extended between Paddington and Reading and on various branch lines. Further extensions occurred in 1929, and by the time these were completed 372 miles of track and 334 engines had been equipped. In 1931 a very great step forward was made when the system was brought into use on the main line routes to Plymouth, Fishguard and Shrewsbury. Now the G.W.R. announce that the remaining 240 miles of main line, to Penzance and Chester, are to be fitted for automatic control.

The primary object of this system is to give audible warning in the cab to a driver when his train is approaching a distant signal in the "danger" position, and automatically to apply the brakes if this warning is disregarded. This makes certain that the train will be pulled up before it reaches the next "stop" signal. Another and distinctive audible indication is given when the distant signal shows "line clear." This is a help in the running of trains when signals cannot be seen because of fog or snow.

The two signals given to drivers are the sounding of a siren indicating "signal at danger," and the ringing of a bell to show that the line is clear. Each therefore is a sound message from the signalman to the driver. Readers who heard a recent wireless broadcast in which these sounds were a feature no doubt will remember the distinctive note of each indication.

The apparatus fitted on the permanent way consists of an immovable ramp, about 40 ft. in length, fixed between the running rails. The ramp consists of a steel inverted T-bar mounted on a baulk of timber. At its highest point it is 4 in. above rail level, and it is connected electrically with a switch in the signal box. This switch is operated by means of the lever controlling the distant signal. When this is in the "off" position, and a train can proceed, current flows to the ramp, but this remains "dead" electrically when the distant signal is on.

On the engine there are a contact shoe, an electrically-controlled brake valve and siren combined, and an electric bell. The contact shoe is fixed on the centre line of the engine, and projects downward to within 2½ in. of rail level. It is capable of being raised vertically, and as it is in line with the ramp it is lifted 1½ in. whenever this is passed over. This lift opens a switch attached to the shoe, and thus brings the bell into play if the ramp is "alive." The siren valve is opened instead if the ramp is dead, however, and at the same time air is admitted through the brake valve, causing the brakes to be applied.

Most people have experienced the difficulty of walking at night, even slowly, through a dark country lane. If we consider the speed of an express train in conditions of poor visibility or thick fog, it is easy to appreciate the value of this system. It operates throughout the 24 hours, guides the trains through to their destination with the least possible delay, and gives a sense of untold confidence and security to the men on the footplate.

In the report of a committee appointed in 1927 by the Ministry of Transport to investigate automatic train control, the G.W.R. system was referred to as being at the time the only fully-developed method, for providing the dual "warning" and "clear" effect at distant signals, which could be recommended as meeting railway requirements in Great Britain. It was considered that the working of the system showed it to be sufficiently reliable for general use.

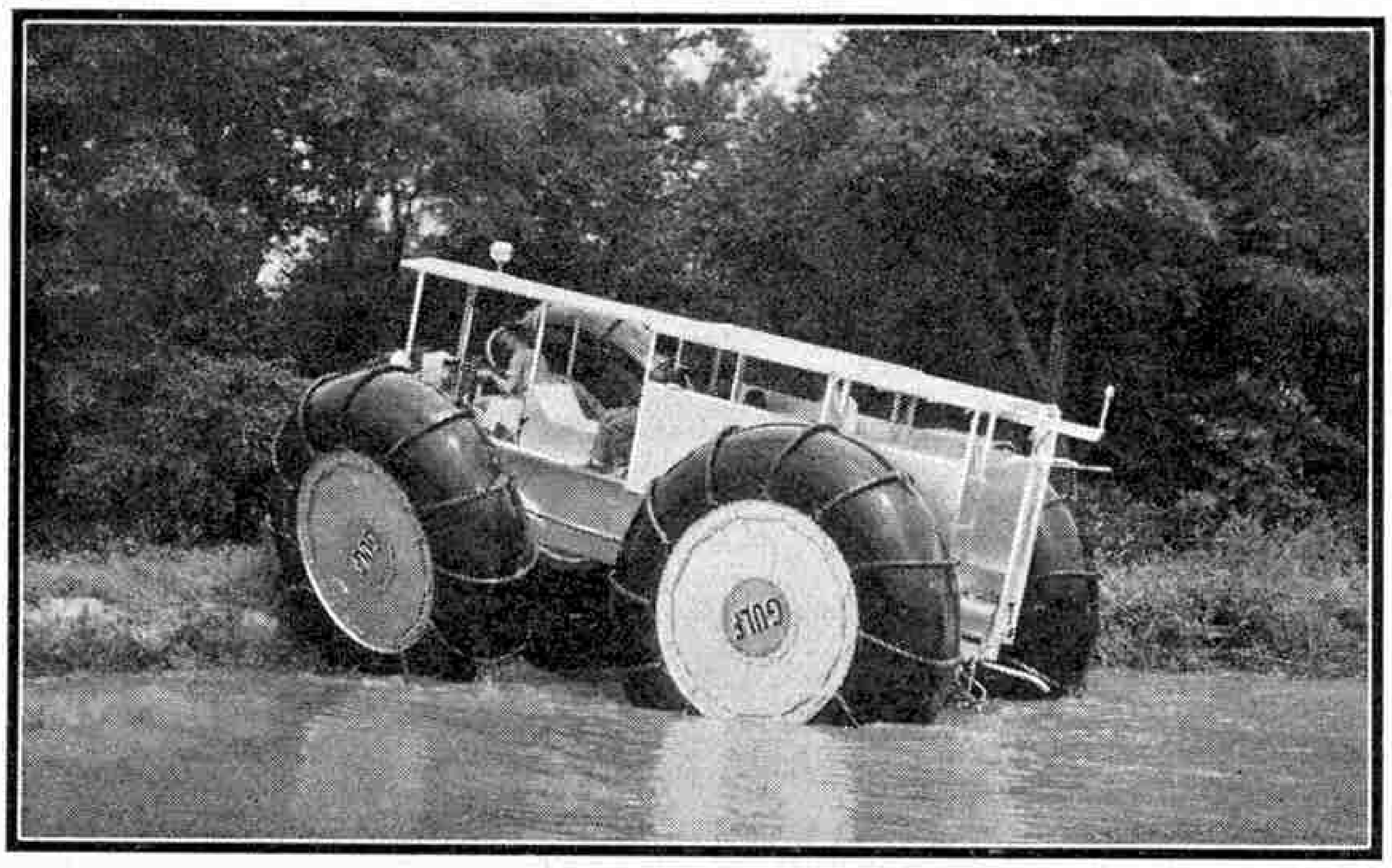
The Marsh Buggy

A Motor Car and Tractor that Swims

SOME of the most prolific oil fields in the world are hidden under soft and slippery swamps, over which it is difficult or impossible to pass by ordinary means. Because of this they cannot readily be surveyed or prospected, operations for which comparatively heavy equipment is now required. Swamps of this kind are encountered on the shores of the Gulf of Mexico and elsewhere in Louisiana, in the Southern United States. The marshes there cannot be penetrated on foot, and can only be explored in boats of shallow draught that are too small to carry the prospectors and their outfit.

This unsatisfactory position has been brought to an end by the design and construction of the "Marsh Buggy," which is shown on our cover. This is at once a boat, a motor car and a tractor. The idea of building it was due to Mr. Abbot Lane, an engineer of the Gulf Research and Development Co., and the engineers working on his plans have converted what might have remained a fanciful idea into a reality.

When it was completed and ready for service Mr. Lane's creation weighed about 3½ tons. Yet it could stand on a swamp where the weight of two men would sink a 20-ft. pile, and could roll over land, mud and water. Its speed on firm ground was 35 m.p.h. and it could travel at 12 m.p.h. in mud waist deep and at 6 knots in water.



The marsh buggy climbing on to the bank of a muddy stream with the aid of the treads on its huge tyres. We are indebted to the courtesy of the Gulf Oil Corporation, Pittsburgh, U.S.A., for this illustration, and for the photograph on which our cover is based.

The chassis of the machine is made of aluminium, and is like that of a large passenger car. It is driven by an 85 h.p. passenger car engine and transmission, and this unit is coupled in series with a tractor gear box, from which the rear axles project. Between them the two gear boxes provide 10 speeds forward and six in reverse, and an interesting feature is that the 10th forward speed is obtained by putting the gears in both gear boxes into reverse.

The front wheels are driven by sprocket chains from the back axle, and thus there is a differential action between the two wheels on one side and those on the other. The front axle is pivoted in the centre in such a manner that either wheel can be raised 2 ft. above the other without distorting the frame.

The giant wheels of the marsh buggy attract notice immediately it is seen, and indeed these are the secret of its unique powers. They are made of aluminium and have a diameter of 5 ft. 6 in. On them are monster pneumatic tyres, the largest ever made, which are about 10 ft. in diameter and 3 ft. in width. Nothing would happen even if they were punctured, for a constant pressure can be maintained in them by starting a small compressor that pumps air into their inner tubes, and this would be sufficient to keep the tubes fully inflated until repairs or replacements could be made. The air pressure in the tyres never exceeds 6 lb. per sq. in. Actually a pressure of 1 lb. per sq. in. would be sufficient for the support of the vehicle, in spite of its great weight.

On dry land the marsh buggy would roll forward without difficulty if the tyres were plain, but special steps have been taken to enable these to take a grip in slimy, boggy ground. On each wheel there are 12 treads, each consisting of rubber tyres 2 in. in diameter. These are sealed at their ends and provided with valves through which they are inflated to a pressure of 40 lb. per sq. in. They not only enable the wheels to grip in any form of mud, but also convert them into paddle wheels for use when the vehicle goes swimming. In spite of its immense weight this rides on the water with its wheels immersed to a depth of less than 2 ft., because of the great buoyancy its giant tyres give it.

The marsh buggy is licensed as a power boat. It carries navigation lights exactly like any other vessel of this kind, and for this purpose is provided with a mast at the rear and a short bowsprit. The latter carries the red port and green starboard lights, and can be folded against the prow when it is not required.

Navigation also has to be provided for. Landmarks are scarce in the swamps and steering is done entirely by compass. If the compass fails the pilot can find his way home again by simply retracing the tracks made in the mud by his huge tyres. In the swamps marsh grass often reaches a height of 12 ft. or more, preventing the driver from seeing where he is going. In this case a member of the crew is stationed upon a small platform at the rear of the vehicle in order to act as an observer. This platform also is used as a stand for setting up surveying instruments.

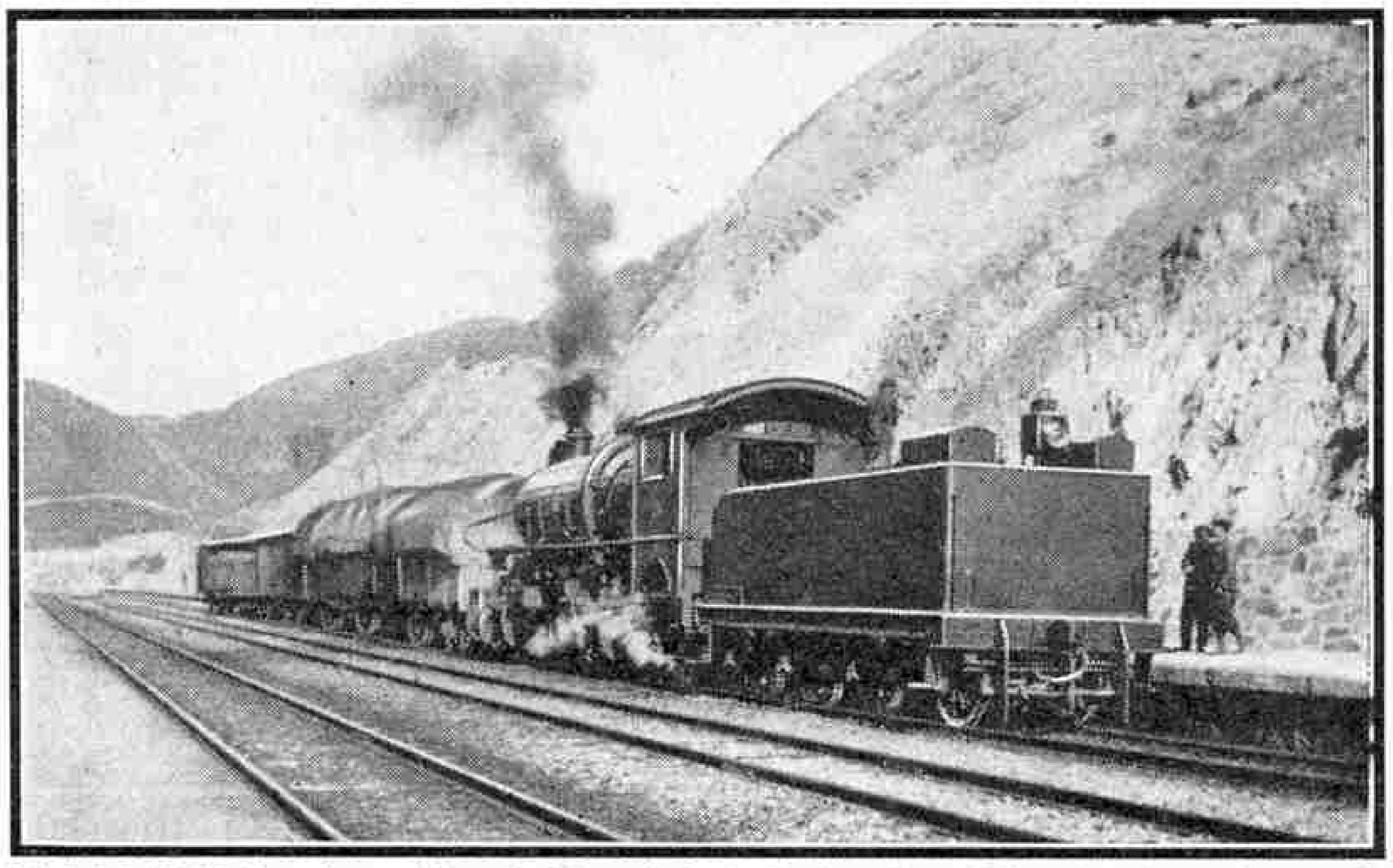
With this unique vehicle the Gulf Research and Development Company have been able to work unhampered in regions where penetration by ordinary means is impossible. The worst ground conditions have failed to affect its use. It resists wind and rain, and on water rides waves like a cork.

The Chinese National Railways

Features of a Remarkable System

By a Railway Engineer

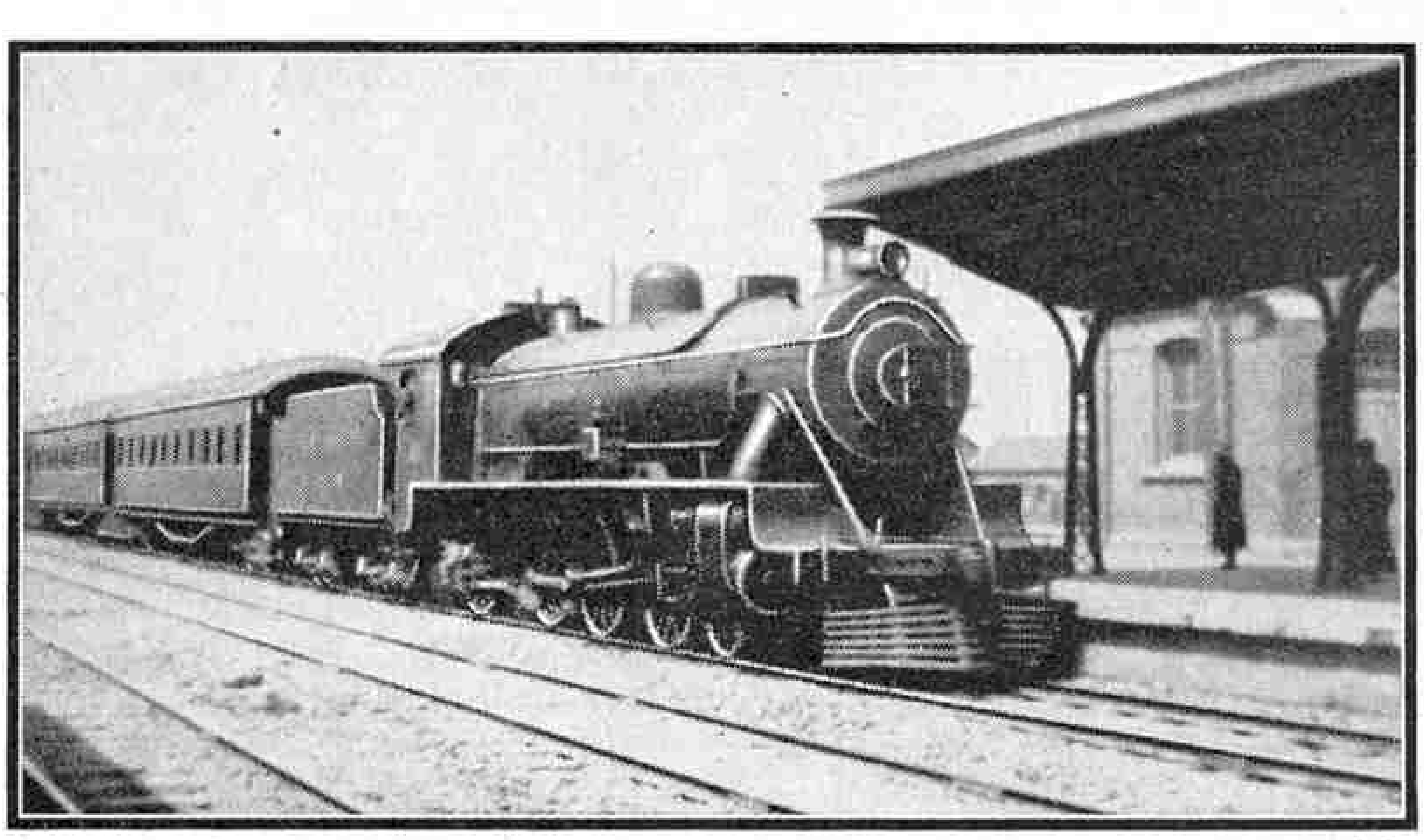
CHINA is unfortunately very much in the news at present. Transport is playing an important part in the fighting that is now in progress, and as so little is generally known in regard to the railways of China I have prepared at the Editor's request a short article on the main lines in the country and the locomotives that are used.



A 0-6-6-0 "Mallet" engine pushing a freight train in the Nankow Pass. This and the lower photograph on the next page are reproduced by courtesy of the North British Locomotive Co. Ltd., Glasgow.

Considering the vast extent of China and her still vaster population the railway system of the country can only be described as meagre. In the great plains of the north, where lie most of the big cities, there is a very extensive network of waterways, based on the Yangtze and the Yellow River. The native Chinese were quite content to go about their unhurried ways of old, and so railways have only been constructed where foreign influences are most marked, where bustling European traders wanted a means of getting about quickly. Some lines, it would seem, were thrown down anyhow, as in the case of the railway between Puchow and Tatung, on the fringe of Mongolia; here a public highway was appropriated for the track, and where this was not available no more substantial road-bed than virgin soil sufficed. But on the whole the Chinese railways have been soundly planned and are well run.

Until the present disturbances the Shanghai–Nanking line was one of the fastest and busiest routes. It runs through the dead flat country of the Yangtze delta, which with its wealth of rivers and intersecting canals is strongly reminiscent of Holland. For tens of miles at a time the track is dead straight, though being single throughout no sustained high speed is possible. This railway has the distinction, so far as I can trace, of being the last in the world to purchase or build single-driver express locomotives. For in 1910, Kerr Stuart and Co. Ltd., of Stoke-on-Trent, supplied some very handsome 4–2–2s for duty on the fastest trains. As might be expected, these engines were almost totally English in appearance, though nowadays one finds English, German and American locomotives in about equal proportions on the Chinese railways.



An express train on the Tientsin-Pukow Railway at Tientsin East station. The locomotive is a 4-6-2, a wheel arrangement commonly in use for passenger and other kinds of traffic.

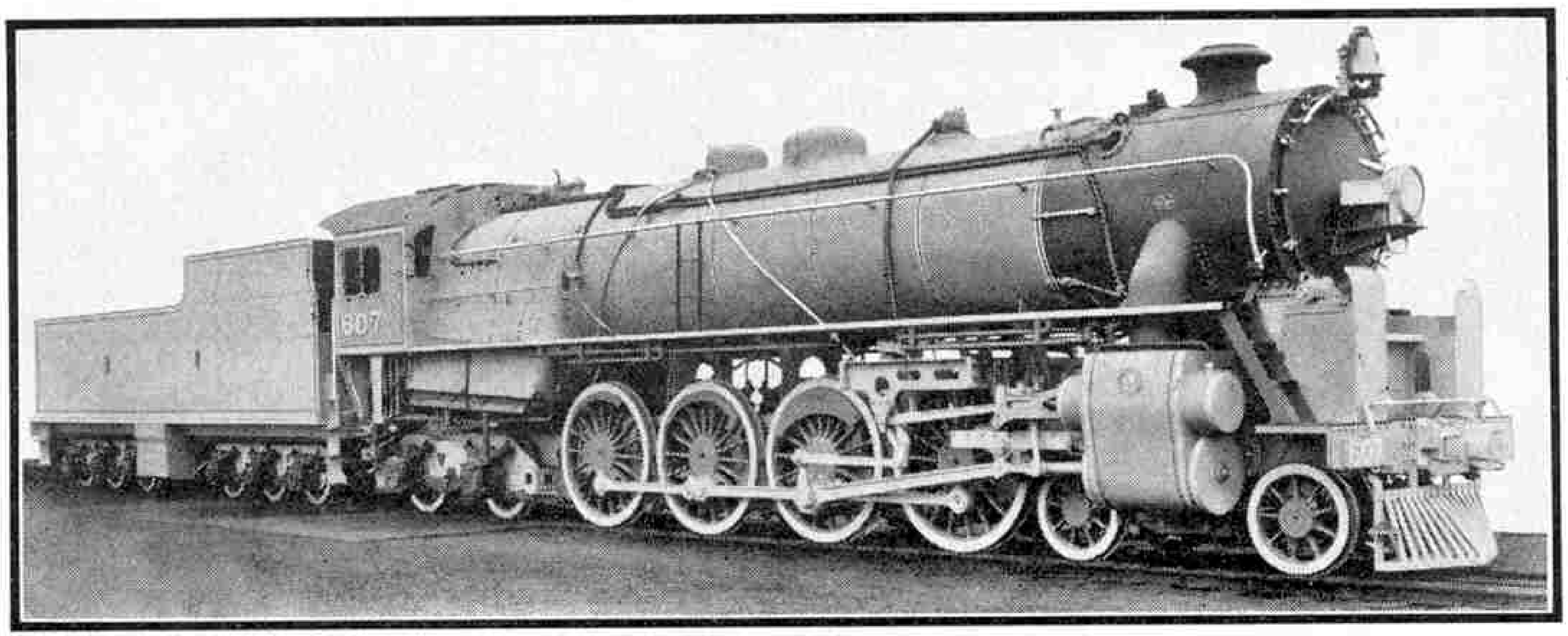
To continue one's journey northward from Nanking, the present capital city, to Pekin, the ancient capital of the Manchu Dynasty that is now called Peiping, involves crossing the Yangtze. At Nanking this great river is just over a mile wide. A train ferry service is in operation, to Pukow on the north bank, and it is possible to travel by through express from Shanghai to Peiping in 40–42 hours. These are some of the best trains in China, having first and second-class sleeping cars; but as the distance is only 906 miles the speed is not exactly meteoric, even when making allowance for the ferry stage. Writing of the different classes of travel reminds me of the extraordinary system of charging children's fares used on the Shanghai–Nanking line. Here the fares are graded according to height! A child under 2 ft. 6 in. goes free; between 2 ft. 6in. and 4 ft. half fare is charged, and above 4 ft. tall full fare.

Six hundred miles north of Shanghai, and lying at the northern extremity of the grand canal, is the busy port of Tientsin, and for the trunk line that runs southward to Pukow the Manchester firm of Nasmyth Wilson and Co. Ltd. recently supplied some powerful 2–8–2 tender engines. The original design was Baldwin's, and these locomotives must constitute one of the very few instances, if not the only one, of an English locomotive firm working to American drawings. Their outward appearance is not quite so transatlantic as might be imagined, and the design is an excellent one; the most unusual feature is the use of piston valves no less than 11 in. in diameter. In this country the 9 in. valves of the Gresley streamlined "Pacifics" are considered big, but since then the Vulcan Foundry Ltd. have supplied some engines to China with 12⅝ in. diameter piston valves. I shall have more to say about their remarkable machines when I come to the Canton–Hankow line.

The Chinese railways have had more than their fair share of war-time conditions, and this especially applies to the lines running north of Peiping. The great trunk line from south to north is continued from Peiping into the Japanese territory of Manchukuo on the metals of the one-time Pekin–Mukden Railway. Manchukuo, much better known by its truly ancient name of Manchuria, was until recently an important unit of the Chinese Empire. At Harbin, in the far north of the province, connection is made with the trans-Siberian line from Moscow to Vladivostok, but the connection is of no value for through running, as the physical link between the two systems involves a slight though vital break of gauge. The Soviet line is 5 ft. gauge, whereas in China the British standard gauge of 4 ft. 8½ in. is used.

One of the most fascinating railways in North China is the Pekin–Kalgan, to give it the original title. From the plains this remarkable line works its way through exceedingly wild hill country into Mongolia, beyond the Great Wall of China to the great mountain ridges of the Khingan Range. Kalgan, indeed, lies on the threshold of the great Gobi desert; it is the collecting point for vast quantities of tea, which is brought in by peasants, coming in long and picturesque camel processions. The railway is one of very severe grading; it includes a stretch of 1 in 30 in the Nankow Pass, where among wild barren hills there comes a first glimpse of the Great Wall.

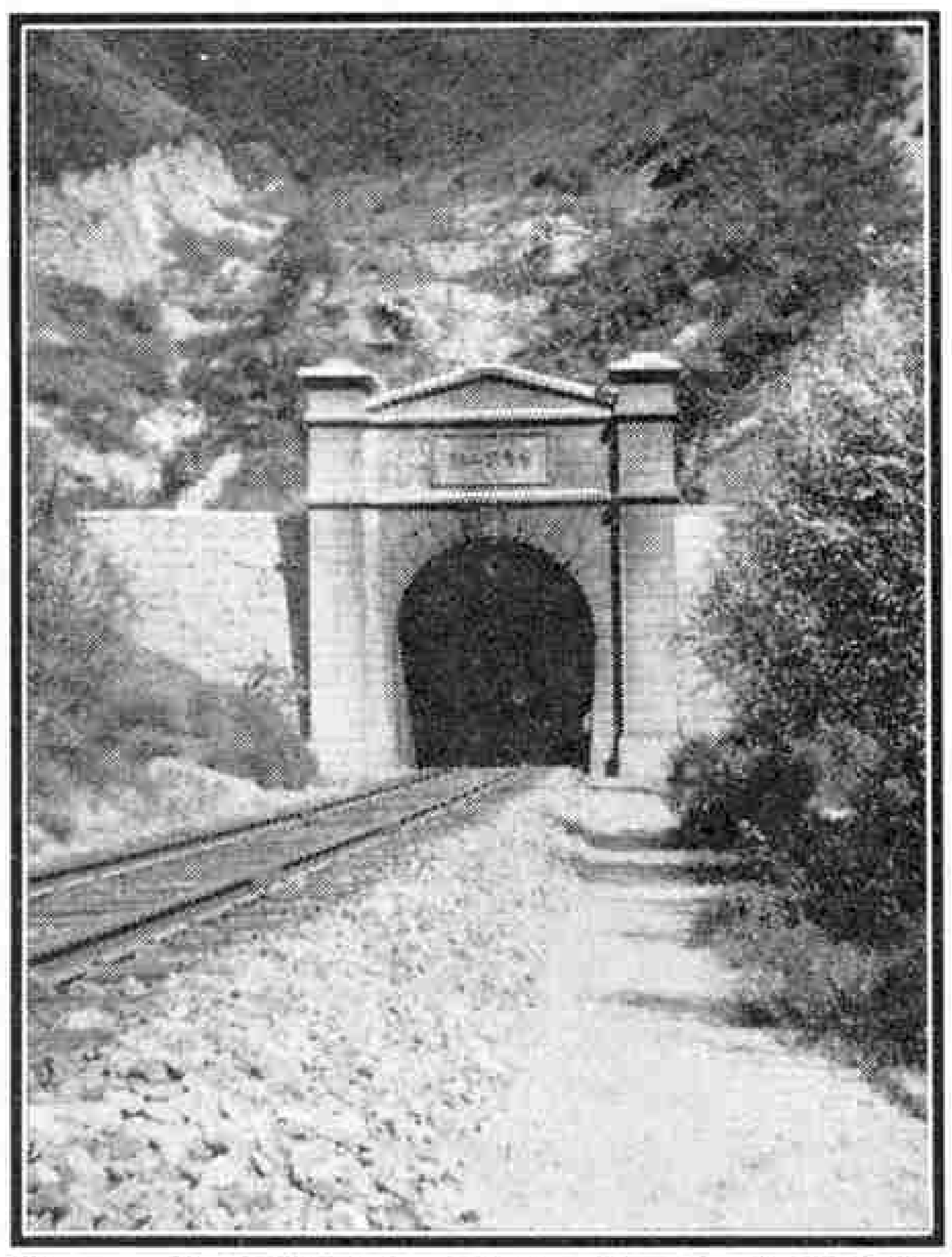
From the very opening of the line unusually powerful locomotives were employed. Some of the first engines were 0–6–6–0 Mallet articulated compounds built by the North British Locomotive Company Ltd.; this wheel arrangement, which, broadly speaking, consists of a boiler and fire-box mounted on two six-wheeled bogie power units, was used on account of the very sharp curves met with. But in recent years the Mallet system has rather gone out of fashion for such work in favour of the most successful Beyer-Garratt principle. A journey to Kalgan can be a real adventure, for here no crack services with luxurious air-conditioned cars are to be found, and on most trains first-class compartments are something of a rarity. The grandeur of the scenery has to be enjoyed from carriages resembling horse boxes with windows let in at the sides, with all sorts and conditions of Chinese peasantry as travelling companions. The Pekin-Kalgan is one of the very few railways in China to be built by a Chinese engineer. The gentleman in question was Mr. Jeme Tien Yow, who was trained in America, and who had most valuable constructional experience with the English engineer who built the Pekin–Mukden railway.



A giant 4-8-4 locomotive of the Chinese National Railways. The 24 engines of this class are the heaviest locomotives yet constructed by the Vulcan Foundry Ltd. of Newton-le-Willows, to whom we are indebted for this photograph.

Mention of the latter line brings me back to the 2,000-mile long north to south route through China, the last link of which, the Canton–Hankow has only just been completed. Until fairly recently it was only possible to travel by train as far south as Wuchang, which city lies on the north bank of the Yangtze opposite to Hankow. Although this point is some 420 miles upstream from Nanking, the train-ferry crossing from Wuchang to Hankow is but little shorter; the Yangtze is indeed navigable by large river steamers for over 1,000 miles from the sea. South of Hankow the country is not unduly difficult at first, though quite hilly compared to the vast plains of the north; but then there comes a wild mountainous region, where railway construction would in any event be a big undertaking, but which was rendered doubly difficult in a country infested with brigands.

Construction of this long through line was begun as long ago as 1900. But after the fall of the Manchu Dynasty in 1912, and the declaration of a republic, the internal affairs of China developed into pure melodrama. Revolt followed revolt; new leaders arose and were swept from the scene in breathless succession, and such an atmosphere was scarcely favourable to industrial development and the construction of such a railway as the Canton–Hankow. So it was not until some years after the World War of 1914-18 that any substantial progress was made. Then, curiously enough, it was the aftermath of a previous Chinese revolt that provided the necessary funds. In 1900 an extreme faction of Chinese opinion showed its resentment of foreign influence and trading in a violent outbreak known as the Boxer rebellion. It was suppressed by an International force in which Britain, France, Germany, Italy, Austria, Japan, Russia and America all combined. The indemnity that China agreed to pay to the various countries concerned had by no means been cleared off some years after the Great War, nearly 30 years later, but to help China, which was by that time a member of the League of Nations, it was agreed to call off the debt providing that the fund established for the purpose was devoted to improvement schemes, such as education, railway construction, and so on.



The mouth of Ching Lung Chiao Tunnel, showing the well-built and ballasted permanent way.

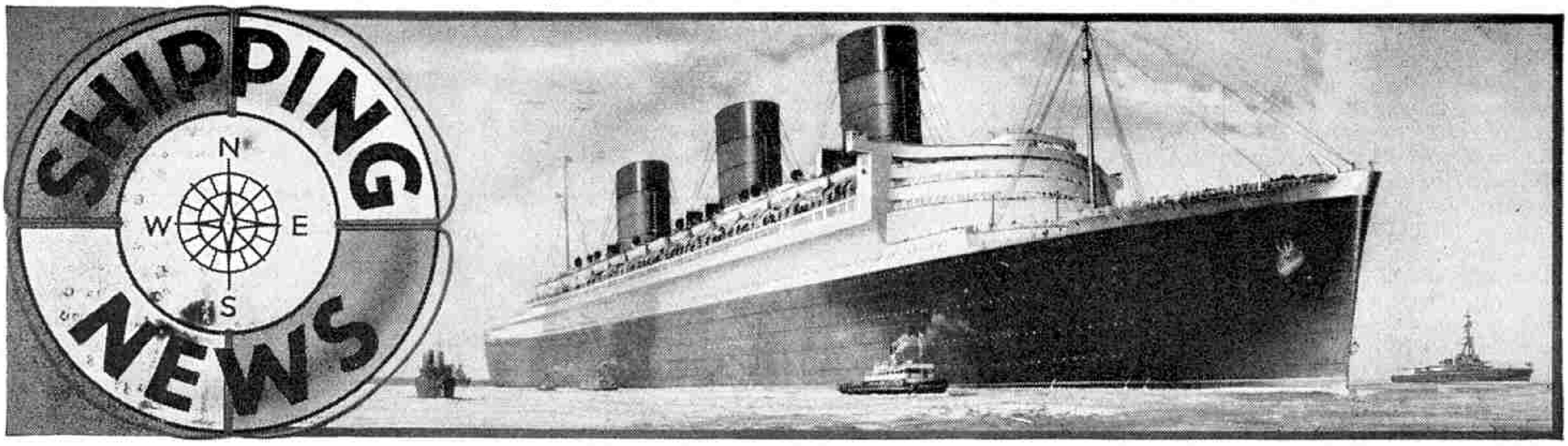
One of the most important outcomes of this arrangement was the construction of the Canton–Hankow railway. This interesting line includes some of the heaviest engineering works in China, and here again, at the most awkward and toilsome locations, the navvies were attacked on numerous occasions not only by mounted bandits but also by river pirates. In one particular sector the track is carried up a narrow ravine of the North River to the summit of the divide between south and north flowing rivers. There was no pathway alongside the water; and the mountainsides were so steep that all materials and men had to be transported by water—no easy task in a river beset with dangerous rapids. In the easier country northward to Hankow, three quite long bridges were necessary to cross rivers, the names of which are the Lei Ho, the Lo Ho, and the Mi Ho!

Over the mountain section of the Canton–Hankow line the ruling gradient is 1 in 85, but such inclines hold no terrors for the mighty Vulcan 4–8–4 locomotives. With a load of 1,000 tons behind the tender the contract speed of these magnificent engines is 15½ m.p.h. on a 1 in 100 gradient. Like most of the giant American types they are 2-cylinder simples, with 20⅞ in. by 29½ in. cylinders. Steam distribution is effected by piston valves of altogether exceptional dimensions; the diameter of these valves is no less than 12⅝ in. and their maximum travel is 9 in. With such a boiler and fire-box a mechanical stoker is absolutely essential, and the tender, which is of comparable dimensions to the engine, is carried on two six-wheeled bogies. The sight and sound of one of these engines forging her way up among the mountains at night, headlamp floodlighting the hillsides ahead, and the echo of her tremendous exhaust flung from rock to rock across the ravine, is a railway event not to be forgotten.

The official opening of the Canton–Hankow line took place in 1935, on 1st April of all days! Strange though it may seem, this date is a very popular one in China for official functions. At the time of opening the railway was not complete, and a road motor service was run over the uncompleted section. Train operation is necessarily a slow business, and up to the present time it has been conducted entirely by train orders. A fairly complete scheme of signalling had been prepared for the intermediate stations and passing loops, and when hostilities began a large part of the necessary apparatus was on the way out from England. The majority of the stations are to be equipped with typically English lower quadrant signals, but for Hengchow, the most important intermediate point between Canton and Hankow, a complete electric relay interlocking has been prepared. When this is installed traffic will be controlled from a switch panel very similar in appearance to that at Leeds East L.N.E.R., which I described in the *"M.M."* for June 1937. The equipment includes day colour-light signals of the searchlight type, and track circuiting throughout the station area.

At Canton, the southern extremity of the line, traffic is handed over from the Chinese National Railways to the Kowloon–Canton Railway, which terminates in the British colony of Hong Kong. Although only 22 miles of the 111 from Canton to Kowloon are in British territory, the line is essentially British in character, and the through expresses are mostly worked by engines of the British section. Here are to be found trains with names as appealing as any in Great Britain, such as *"The Flying Eagle"* and *"The Flying Dragon."* These expresses cover the 111 miles from Kowloon to Canton in just under 3 hours, a good time considering that severe slacks have to be made at all passing loops to exchange tablets by hand.

And so we come to the waterside at Kowloon, and look out over a harbour crowded with junks and sampans, to Hong Kong island and the city of Victoria. Here I must close what is a very brief glimpse into the whole story of the Chinese Railways.



An Interesting Motor Sailer

The illustration on this page shows the Diesel sailing ketch *"Fidalga,"* of 13 tons. She is a full-powered cruiser with moderate sail area, and is better described by the American term "motor sailer" than as an auxiliary cruiser, as the latter implies the use of large sails and small engine.

The boat was built by John I. Thornycroft and Co. Ltd., at their Woolston Works, for Mr. K. C. Barnaby, who is the builders' naval architect. She has a length overall of 37 ft., a beam of 16 ft., and a draught of 4 ft. 3 in., and is rigged as a Bermudan ketch, with a sail area of 424 ft. The power unit is a standard Thornycroft four-cylinder Diesel engine developing 36 h.p. at 1,200 r.p.m., and 47 h.p. at 1,600 r.p.m. The solid three-blade propeller fitted is driven through 2 to 1 reduction gearing.

The *"Fidalga"* is intended for week-end cruising in the Solent area, and also for offshore cruising for longer periods.

"Leviathan" to be Broken Up

Following their decision to build a new super liner for the North Atlantic passenger service, the United States Line have sold the 48,942-ton *"Leviathan"* for breaking up. She has been purchased jointly for £160,000 by two British firms, Thos. W. Ward Ltd. and Metal Industries Ltd., and will be brought across the Atlantic to meet her end.

The *"Leviathan"* was originally the German liner *"Vaterland,"* and was taken over by the American company after the War. She has been laid up at New York for the past two years.

Large Tanker Orders

Several large orders were placed recently with British shipbuilding yards. An outstanding one was that of the Anglo-Saxon Petroleum Company for eight tankers at a total cost of £2,280,000. Four shipping centres have shared in this order. Two of 15,000 tons and one of 12,000 tons are to be built on the Tyne. On the Clyde four of 12,000 tons are to be constructed, and the remaining two are to be built at Birkenhead and Belfast respectively. All the vessels will be of the latest type, with super-charged oil engines.

The Royal Dutch Shell group have placed orders with Dutch shipbuilding firms for eight similar tankers, and with Danish and Italian builders for one further tanker each. Orders for two 9,000-ton vessels have yet to be allocated.

The Diesel sailing ketch "Fidalga," built by John I. Thornycroft and Co. Ltd., Woolston, by courtesy of whom this photograph is reproduced.

The Life-boat Service in 1937

During 1937 the Royal National Life-boat Institution gave rewards for the rescue from shipwreck round the coasts of Great Britain and Ireland of 523 lives, the largest figure for nine years. Of those lives 438 were rescued by means of life-boats, and 85 with the aid of shoreboats.

The busiest month of the year was January, during which there were 67 life-boat launches. To find a larger number in any one month it is necessary to go back 21 years. During January, February and March there were 130 launches, and during the three summer months, June, July and August, there were 78. Besides saving 438 lives, life-boats saved or helped in some way 200 vessels and boats.

Since the Institution was founded 114 years ago, it has given rewards for the rescue of 65,425 lives, an average of 11 a week.

Although the weather this winter has not been as severe as that of the previous one, the fleet of the Institution has been kept busy. A rescue of outstanding gallantry was that of two of the crew of eight of the trawler *"Roslin,"* of Aberdeen. This vessel went ashore late one night on the sands off the River Ythan in a heavy breaking sea. The Aberdeen life-boat reached her at two o'clock on the next morning, to find heavy seas breaking over her and three men clinging to the rigging, the rest of the crew apparently having been washed away. Six times the coxswain manœuvred the life-boat right aboard the wreck before her crew succeeded in throwing lines. Two of the men tied lines round themselves, jumped into the sea and were hauled aboard the life-boat, but the third man fell into the sea and was lost. The life-boat had a piece torn out of her stem below the water-line.

Coxswain Thomas Sinclair, of the Aberdeen crew, has received a second-service clasp to the silver medal he already holds. The bronze medal has been awarded to C. Flett, the second coxswain, and R. J. B. Esson, the acting motor mechanic, and appreciations of their services have been forwarded to the four members of the crew, together with money awards.

Coxswain Sinclair has now won a medal for gallantry three times in two years. He was awarded the bronze medal at Christmas 1935, and the silver medal in January 1937 and again in November. Six medals were won during 1937 by Aberdeen life-boatmen.

Another splendid rescue was carried out by the coxswain and crew of the Great Yarmouth and Gorleston motor life-boat, who saved the crews of two sailing barges, the *"Rochester,"* and the *"Greenhithe,"* London, in a very heavy sea with a gale blowing. Vessels had been signalled not to attempt to enter the harbour at Great Yarmouth. Both barges accordingly anchored outside, and the life-boat put out to take off their crews. The skipper of the *"Lord Rosebery"* had been unconscious since the previous night, and it took six life-boatmen to get him from the barge to the life-boat. After the rescue one of the barges went ashore and the other sank.

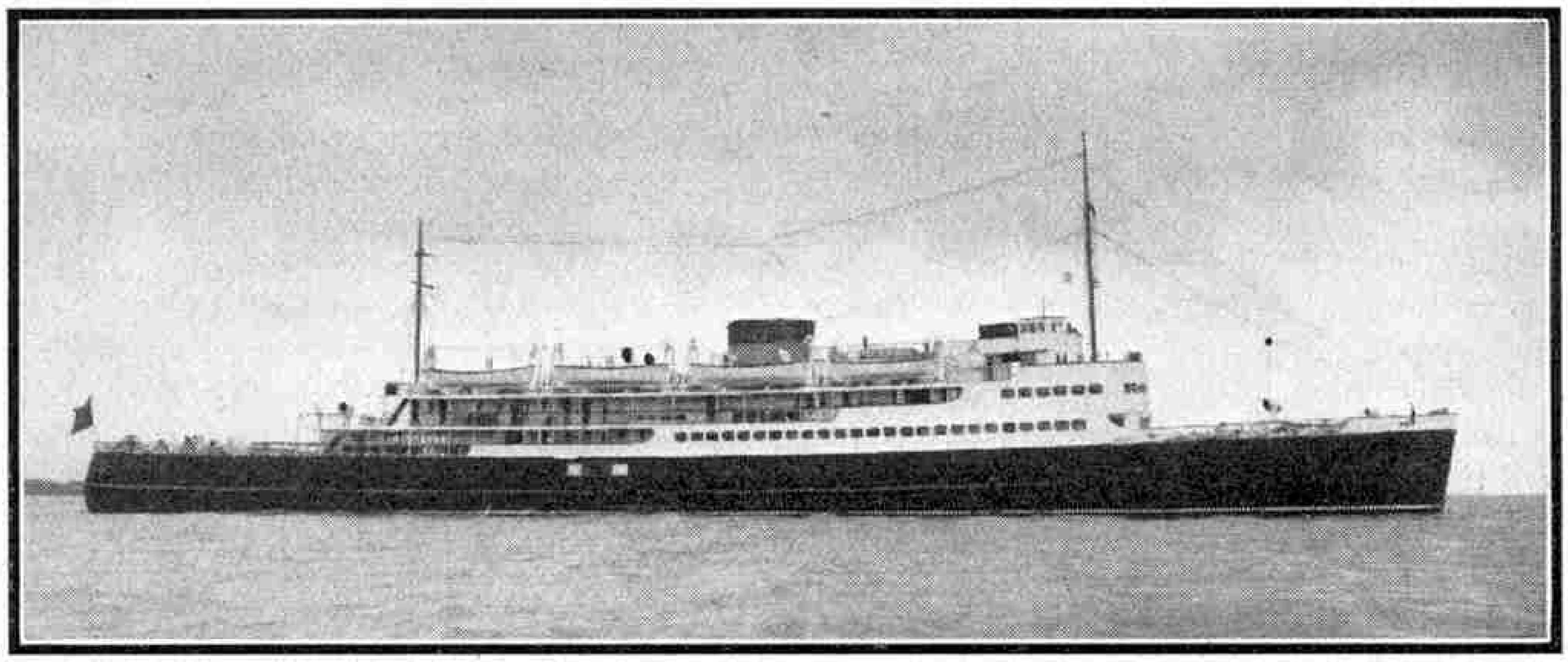
Six Destroyers for Brazil

Orders have been placed in this country for six destroyers for Brazil. The vessels are to be built by Vickers-Armstrongs Ltd., J. Samuel White and Co. Ltd., and John I. Thornycroft and Co. Ltd., and their total cost is said to be over £2,500,000.

The order placed with J. Samuel White and Co. Ltd., is for two ships 323 ft. long, and 33 ft. beam, with a draught of 8 ft. 6 in., and a displacement of 1,350 tons.

The World's Fastest Mercantile Motorship

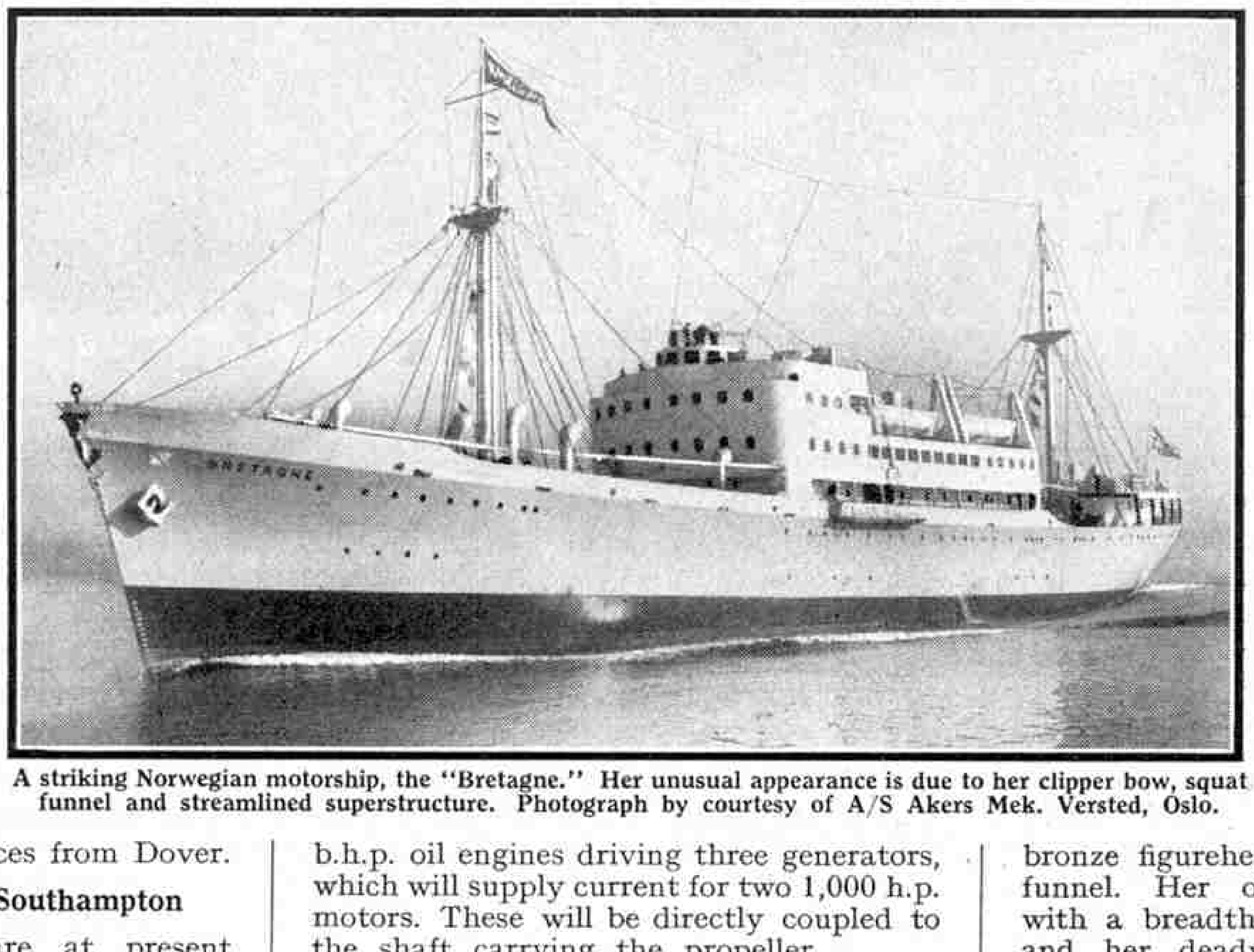
The cross-Channel mail and passenger service between Ostend and Dover was inaugurated in 1847. Since that time Messrs. John Cockerill S.A., the Belgian shipbuilding company, have constructed 28 vessels to the order of the Belgian State Marine Department for use on this service. The two latest vessels commissioned are the motorships *"Prince Baudouin"* and *"Prins Albert,"* which are of generally similar hull and superstructure design. The former boat was completed three years ago, and is the largest motorship entirely built in Belgium. She held the speed record for mercantile motorships for two years, but her new sister ship wrested the distinction from her while on trial. The *"Prins Albert"* attained a speed of 25.5 knots, which exceeded the previous record by a quarter of a knot.



The cross-Channel mailboat "Prins Albert," which with a speed of 25.5 knots is the world's fastest merchant motorship. Photograph by courtesy of Messrs. John Cockerill S.A., of Seraing, Belgium.

The *"Prins Albert"* was completed last September, and joined the Belgian cross-Channel fleet early in the following month. She has an overall length of about 370 ft., and a gross tonnage of 2,938. The propelling machinery consists of two 12-cylinder Sulzer-Cockerill Diesel engines, with a normal output of 15,000 h.p., and a maximum output of 17,000 h.p.

At present the two motorships are operating the service together with older turbine vessels, to a schedule suited to the latter boats. They are therefore not running to capacity, but the reserve is useful when connecting long-distance trains are late, and the boats leave behind time. A high-speed fleet based on these two vessels may soon become necessary, for traffic has increased to a great extent in recent years. Statistics show that the number of passengers travelling between Ostend and Dover was doubled between 1934 and 1936, when there were nearly as many passengers as on the Southern Railway and French Railway services from Dover.



A striking Norwegian motorship, the "Bretagne." Her unusual appearance is due to her clipper bow, squat funnel and streamlined superstructure. Photograph by courtesy of A/S Akers Mek. Versted, Oslo.

Overhauling Liners at Southampton

Southampton Docks are at present undergoing one of the busiest "overhaul" seasons ever experienced there, for 10 large liners were scheduled for inspection, repair or re-decoration between last November and the end of April next. These were *"Queen Mary," "Berengaria," "Aquitania," "Empress of Britain," "Empress of Australia," "Duchess of Richmond," "Montcalm," "Arandora Star," "Atlantis" and "Vandyck,"* the combined gross tonnage of the giant vessels exceeding 325,000.

The first of the giant liners to be overhauled was the *"Empress of Britain,"* which entered the King George V Graving Dock, the largest in the world, on 15th November for a stay of eight days. The last will be *"Aquitania,"* which goes in on the 24th April for seven days. The *"Queen Mary"* spent two weeks there at the beginning of January, and the *"Berengaria"* will take her turn late in March.

Giant Fire-Float for New York

Work is in progress in America on the construction of the largest and most powerful fire-float in the world. The boat is for service in New York harbour, and has a length of 134 ft., a beam of 32 ft., and a displacement of 583 tons. Oil-electric propelling machinery will be fitted, consisting of two 16-cylinder, 1,500 b.h.p. oil engines driving three generators, which will supply current for two 1,000 h.p. motors. These will be directly coupled to the shaft carrying the propeller.

The float will have four fire pumps, each with a capacity of 5,000 gallons per minute at 150 lb. pressure, and driven by a 400 h.p. motor. The fire-fighting equipment includes two hose manifolds with 12 outlets of 3½ in. diameter, and several monitors of varying capacities. The boat has a designed speed of 16¼ m.p.h., and in service should prove very efficient on the crowded New York waterways.

A Marine Engineering Scholarship

The General Committee of Lloyd's Register of Shipping offer a scholarship, valued at £100 per annum and tenable for three years, to be awarded on the results of the Studentship Examination of the Institute of Marine Engineers in May next. The Scholarship is intended to assist marine engineering students to take an advanced course of instruction in engineering subjects. The age limit is 18 years to 23 years and the closing date for entries is 16th April, 1938.

Further particulars, entrance forms, and copies of previous papers may be obtained on application to the Secretary of the Institute of Marine Engineers, 85, The Minories, London, E.C.3. The entrance form for the Scholarship is distinct from the entrance form for the Studentship Examination, and a candidate for the Studentship who wishes also to compete for the Scholarship must complete and return both forms by the dates specified.

Launch of 18,500-Ton Welded Ship

The largest welded ship yet built was launched recently in Pennsylvania. This was the *"J. W. Van Dyke,"* a tanker for the Atlantic Refinery Company.

A Norwegian Motorship

Diesel engines have become very popular for vessels of medium size, particularly in Norway, where fuel is available in large quantities, and need not be imported as is the case in England.

An interesting example of a Norwegian Diesel-engined ship is the *"Bretagne,"* built by A/S Akers Mek. Versted for Messrs. Fred Olsen and Company. She was completed early in 1937, and commenced her maiden voyage on 1st April on her owner's passenger service between Oslo and Antwerp. The vessel is of striking appearance, as the lower illustration on this page shows. This is due chiefly to her clipper bow, decorated by a bronze figurehead, and her squat, rakish funnel. Her overall length is 314 ft., with a breadth moulded of 45 ft. 10 in., and her deadweight capacity is 2,150 tons. She attained a speed of 16 knots on her trial run.

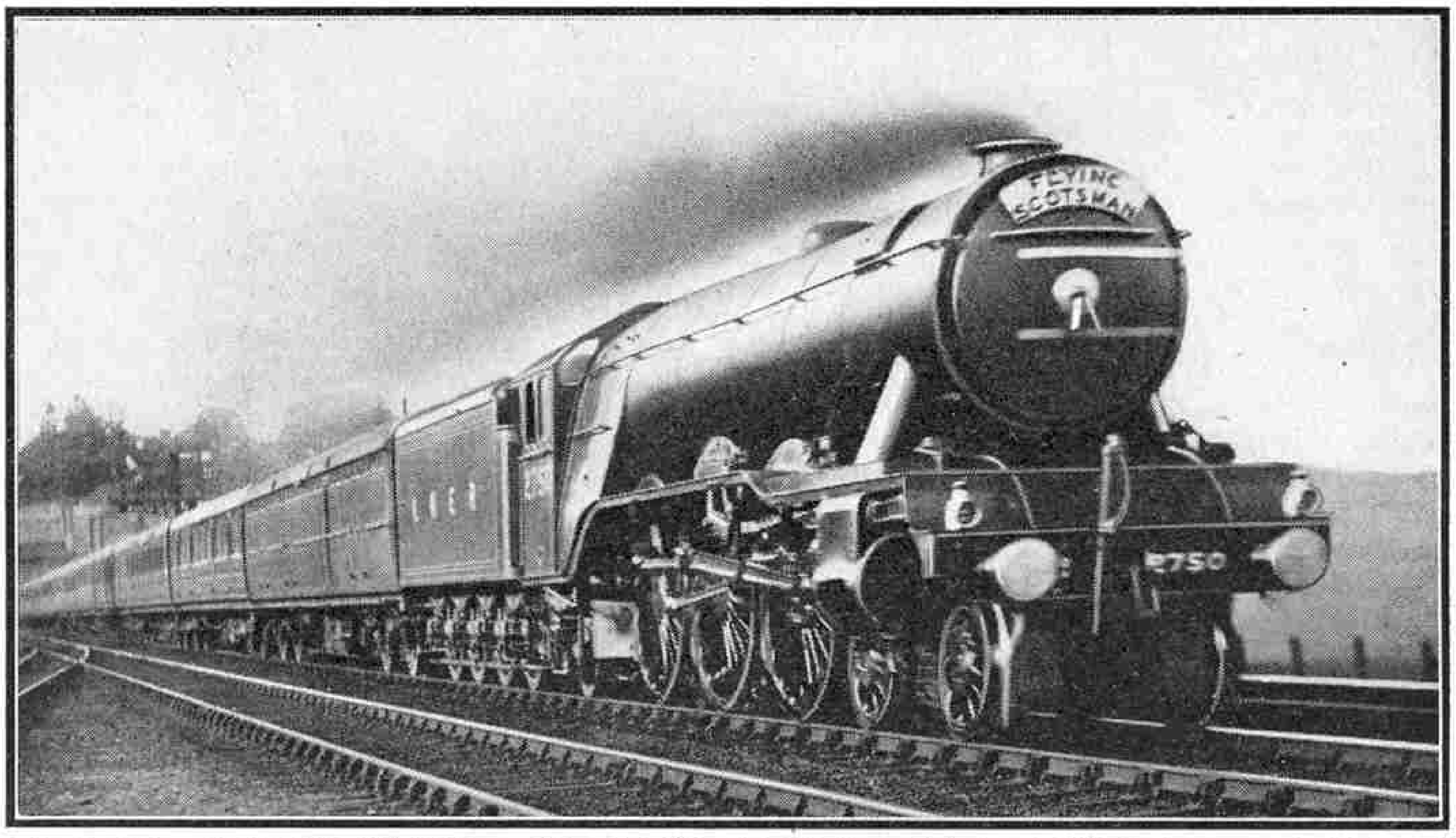
The machinery comprises a nine-cylinder engine of Akers-Burmeister and Wain solid injection type. There are three auxiliary engines, each of which is coupled to a 100 kW dynamo.

The accommodation is to first-class specification, and about 130 passengers can be carried in three classes.

Sir Nigel Gresley, C.B.E.

L.N.E.R. Honour Their Chief Mechanical Engineer

ALL readers have been interested in the announcement in our *"Railway News"* pages last month that the 100th L.N.E.R. standard "Pacific" locomotive had been named *"Sir Nigel Gresley."* The L.N.E.R. directors have taken this step to honour their distinguished Chief Mechanical Engineer, in recognition of his work for the L.N.E.R. and his services to transport generally. The locomotive is No. 4498, and the naming ceremony took place at Marylebone Station. Mr. W. Whitelaw, chairman of the L.N.E.R., unveiled the nameplate of the engine in the presence of directors and officers of the company, and also presented to Sir Nigel Gresley a silver replica of the engine. This unusual practice of naming a locomotive after its designer during his term of office is another important event in a distinguished railway career.



A Gresley "Super-Pacific," No. 2750 "Papyrus," hauling "The Flying Scotsman." In March 1935, in the course of a high-speed non-stop test run, this locomotive reached a maximum of 108 m.p.h., then a British record.

Sir Nigel, or Mr. H. N. Gresley as he then was, served his apprenticeship at that most famous of training grounds for locomotive engineers, the Crewe Works of the former L.N.W.R. Subsequently he became a pupil at Horwich, on the Lancashire and Yorkshire Railway. His connection with the East Coast Route began in 1905, with his appointment as Carriage and Wagon Superintendent of the Great Northern Railway. In this position his originality soon manifested itself in the design of the well-known Gresley patent system of coach articulation. This was devised with the object of improving the riding of some six-wheeled corridor vehicles that had been standard East Coast stock for main line trains, and was the commencement of the system of articulation that has since been widely applied, first on the G.N.R., and later on the L.N.E.R.

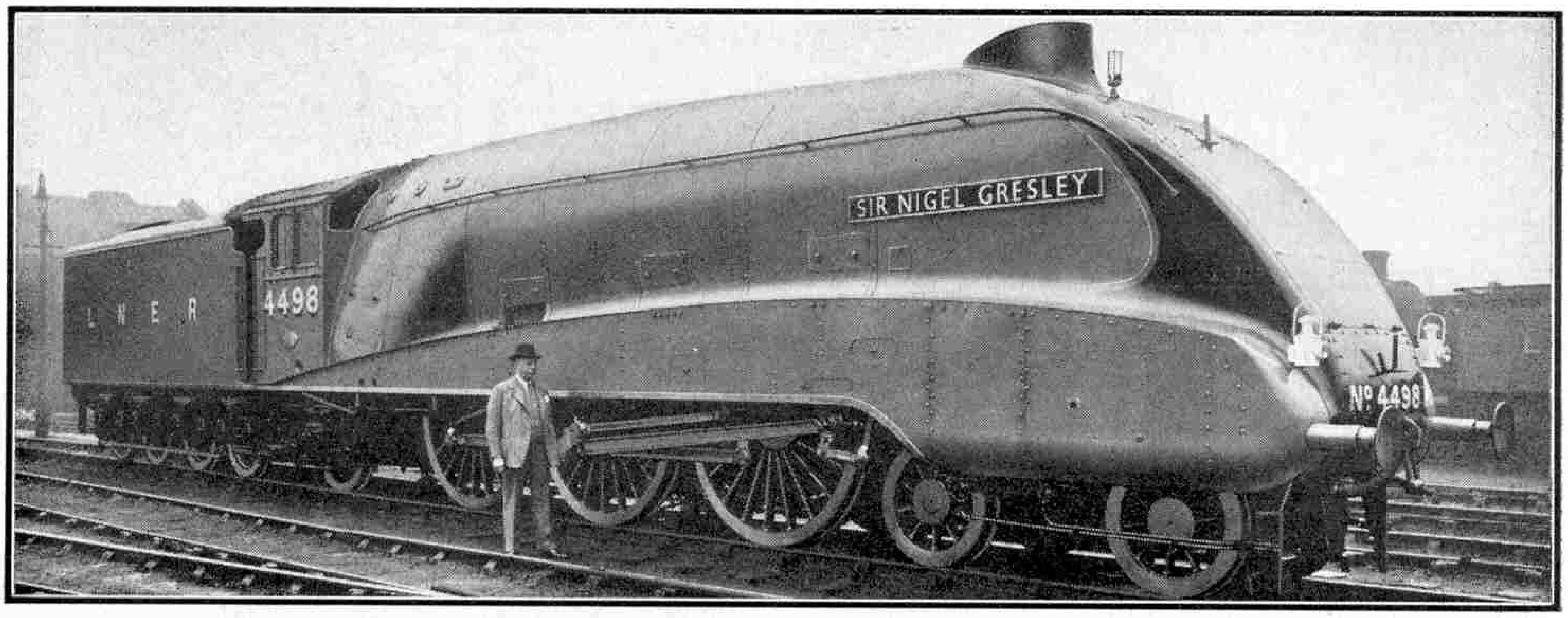
In 1911 Sir Nigel succeeded Mr. H. A. Ivatt, who had been chief of the locomotive department at Doncaster. He thus became responsible for the whole of the locomotive, carriage and wagon stock of that line. The first new engines that he designed were the "K1" class 2-6-0s, and in them the originality characteristic of all Gresley designs was at once evident. The wheel arrangement he adopted had long been neglected by British locomotive engineers; and other comparative novelties of the "K1s" were outside cylinders and Walschaerts valve gear.

The locomotives for which Sir Nigel Gresley is best known, however, are undoubtedly his famous "Pacifics." The first of these appeared from Doncaster Works in 1922, while the Great Northern Railway was still a separate company; and the name *"Great Northern"* given to the first engine No. 1470, now No. 4470, effectively identified it with the old G.N.R.

These "Pacifics" were the first new design of note to be produced in this country since pre-War days, and constituted a considerable advance in size and power over existing British express locomotives. It was claimed that they were designed to handle 600-ton trains, and their ability to do so was proved in September 1922, when a test train of 610 tons, an exceptional load for those days, was hauled between King's Cross and Grantham by No. 1471, the second engine built. The average speed for this run was 52 m.p.h.

In 1923 came the grouping of the railways into the present big companies, and with it the appointment of Sir Nigel as Chief Mechanical Engineer of the newly-formed L.N.E.R. The "Pacifics" then became a standard design for L.N.E.R. main line work, and the working of these engines was extended over routes that previously had been foreign to Doncaster locomotives. Their work from that time on forms a magnificent record. They have always been remarkable for endurance. With the commencement in 1928 of the longest non-stop run in the world, that of *"The Flying Scotsman"* between King's Cross and Edinburgh, it became necessary for the engines to work continuously throughout a journey of nearly 400 miles. Yet on this service one of them, No. 2569 *"Gladiateur,"* ran for 74 successive days without developing any defect, and in the course of three months' running covered 29,000 miles.

A notable development in connection with the non-stop running of *"The Flying Scotsman"* was the

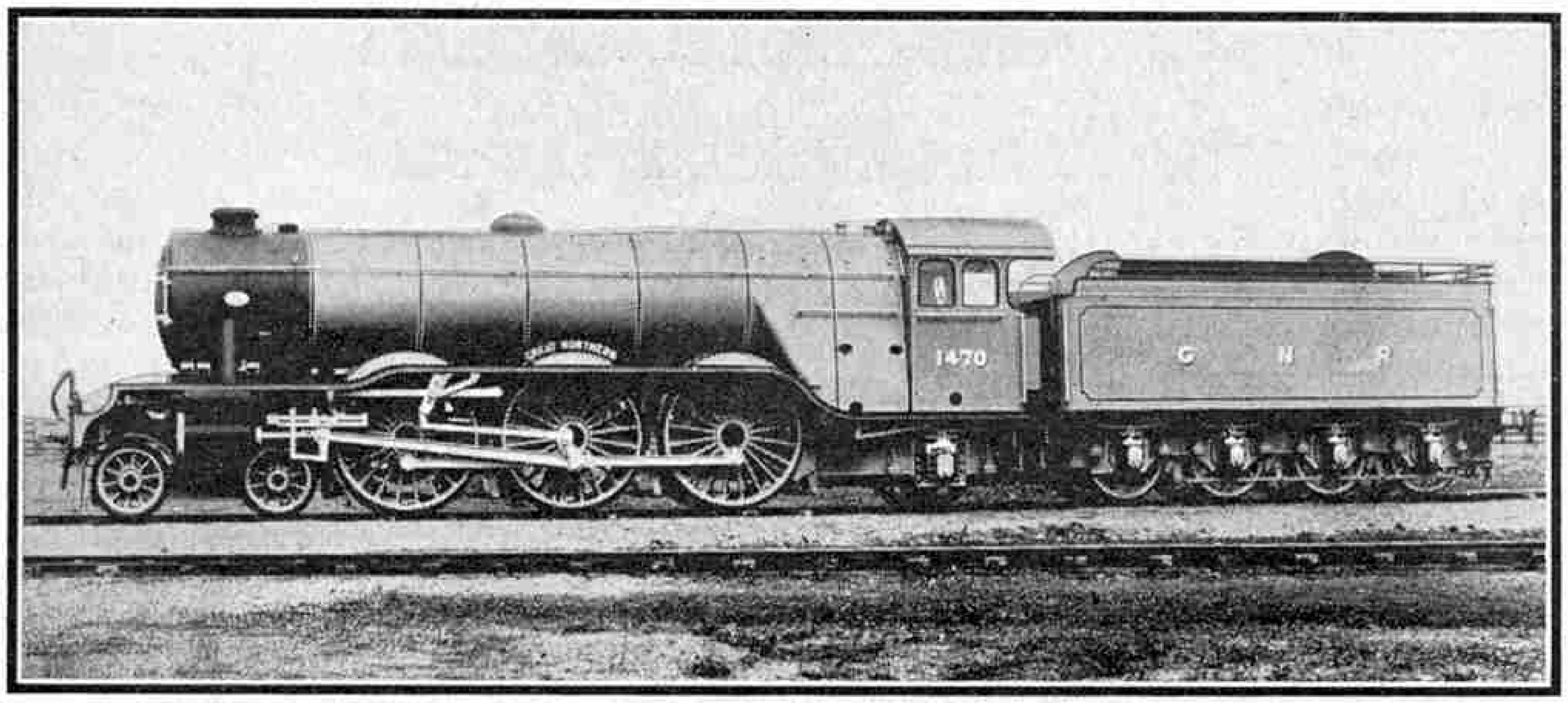


Sir Nigel Gresley, C.B.E., standing alongside the streamlined "Pacific" locomotive No. 4498 that has been named after him. The naming of a locomotive after its designer during his term of office is an unusual distinction. No. 4498 is the 100th Gresley "Pacific" locomotive. Photograph by courtesy of the L.N.E.R.

introduction of the unique corridor tenders incorporating a passage-way through from the rear to the footplate end. These permit the enginemen to be changed on the run, thus avoiding the necessity of a single crew working throughout the 400-mile journey.

It was one of the original "Pacifics," the famous No. 4472 *"Flying Scotsman,"* that achieved the first authentic British record of 100 m.p.h. by a steam locomotive. This was in November 1934 on the occasion of a special run between King's Cross and Leeds.

Various experiments in the direction of greater efficiency resulted in the appearance of the "A3" series of "Super-Pacifics." These are similar in general design to the first or "A1" series, but incorporate various improvements, particularly boilers pressed at 220 lb. per sq. in. in place of the original 180 lb. per sq. in. One of the "A3 Super-Pacifics," No. 2750 *"Papyrus,"* set up a new speed record of 108 m.p.h. early in 1935 on the return journey of a special high-speed trip between King's Cross and Newcastle.



The first Gresley "Pacific" locomotive, G.N.R. No. 1470, appropriately named "Great Northern," which appeared in 1922. From this pioneer design have been developed in succession the "A3 Super-Pacifics" and the "A4" streamlined engines.

These runs led directly to the introduction of the world-famous *"Silver Jubilee"* express between Newcastle and London in September 1935. For this duty the same "Pacific" design was further improved both internally and externally. A boiler pressure of 250 lb. per sq. in. was adopted, and special attention was given to the design of the cylinders and front end generally to make the greatest possible use of this higher pressure. External improvements consisted in providing a streamlined casing with the characteristic wedge-shaped front that has since become such a familiar feature on the L.N.E.R. Speeds of over 100 m.p.h. are easily reached by these locomotives, although in ordinary service a maximum of 90 m.p.h. is usually observed. The first of them, No. 2509 *"Silver Link,"* reached 112 m.p.h. on a trial run of *"The Silver Jubilee,"* and later No. 2512 *"Silver Fox"* reached 113 m.p.h., at that time the British record maximum speed. On this occasion an average of 100 m.p.h. was maintained for 17 miles.

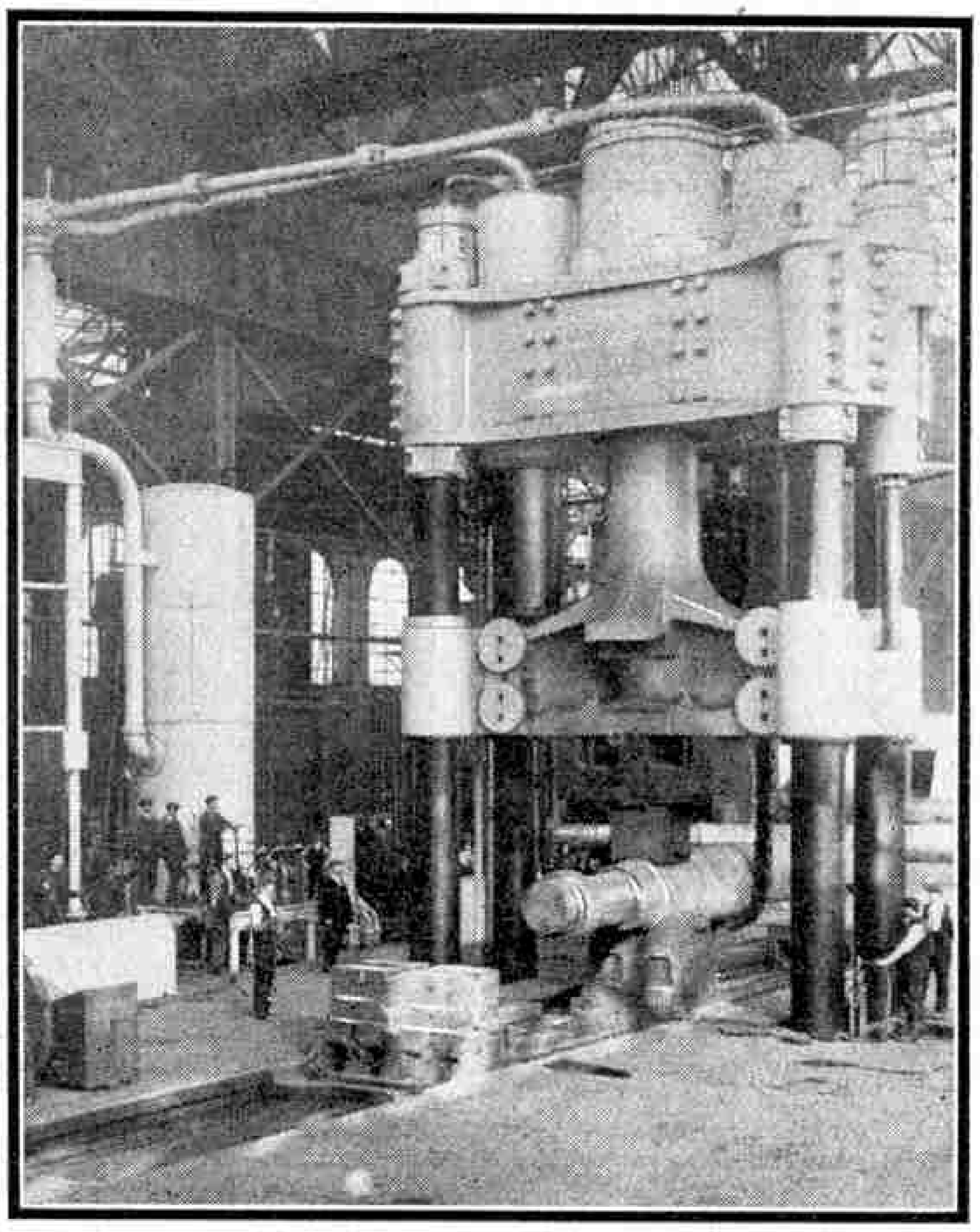
The success of *"The Silver Jubilee"* resulted in the introduction last year of the *"Coronation"* express, the fastest train in the British Empire, and the *"West Riding Limited."* For these services further "Pacifics" of the streamlined "A4" series were introduced. Of these No. 4491 *"Commonwealth of Australia"* worked 48 out of the first 51 trips of the *"Coronation"* express, which involved running 18,864 miles at average speeds of over 70 m.p.h. without the slightest defect. Similarly No. 4492 *"Dominion of New Zealand"* made 52 consecutive trips on the non-stop *"Flying Scotsman,"* running up a total mileage of 20,436 without any repair being necessary. The 100th Gresley "Pacific," No. 4498, thus belongs to a distinguished line of locomotives, and is a worthy subject for the distinguished name it bears.

The originality and boldness of Gresley practice is well known. Sir Nigel showed great enterprise by the introduction of special valve gear for three-cylinder locomotives, and the building of "Pacifics" at a time when no other British railway had standardised such a design. He maintained this reputation by the design of No. 2001 *"Cock O' the North,"* the first British passenger express engine with eight coupled wheels, and by the introduction in this country of effective locomotive streamlining. These are only some of his great achievements.

A Century of Steel

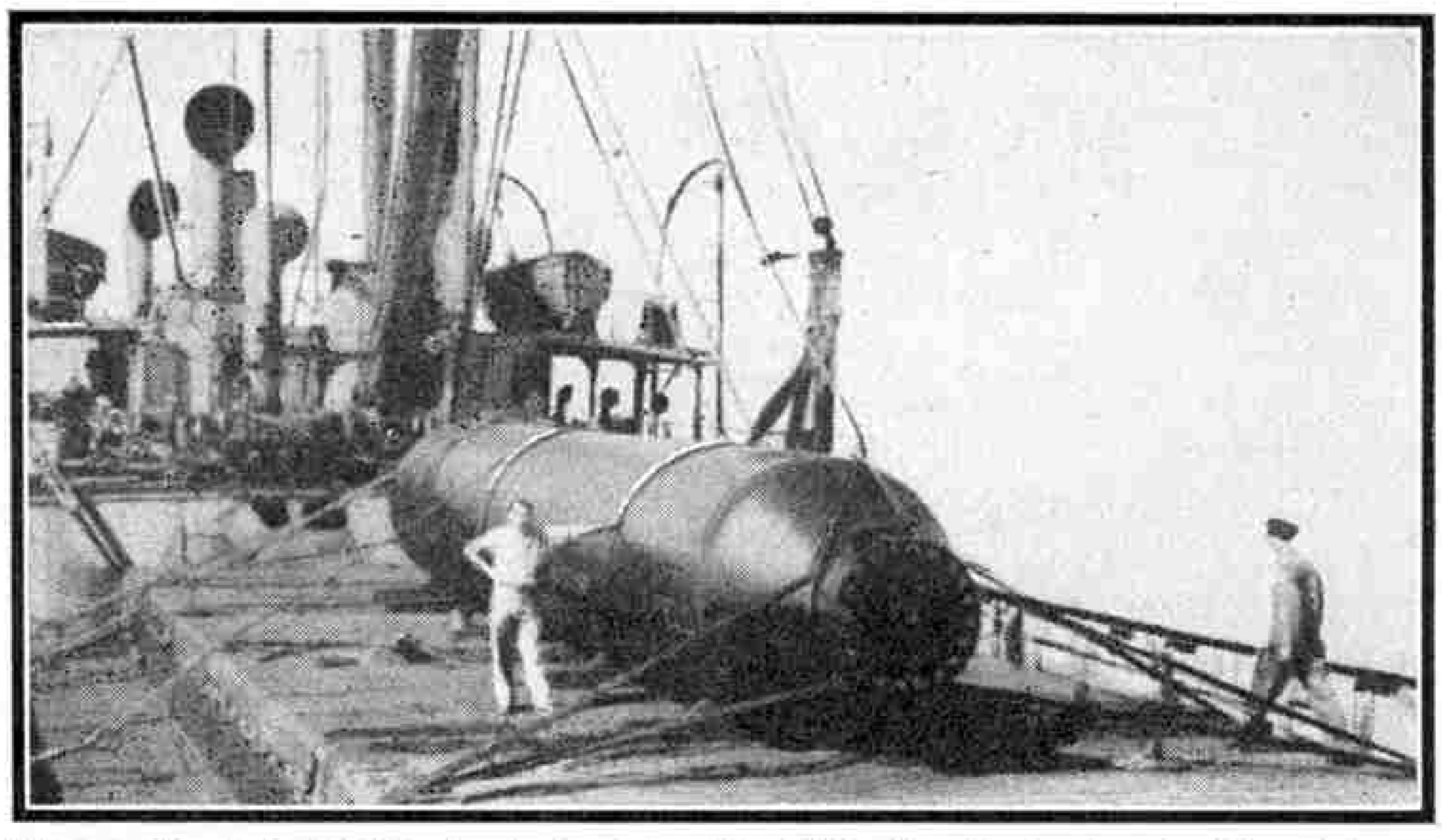
The Romance of a Great Sheffield Company

IN 1837 John Brown, a young Sheffield man, rejected the idea of becoming a linen draper, as his father intended him to be, and instead boldly set up in business for himself, making steel and steel products. Five years later two other Sheffield lads named Mark and Thomas Firth set up as steel melters on their own account. To-day these businesses have been merged into the great firm of Thos. Firth and John Brown Limited, which has interests in every branch of the iron and steel trade, including shipbuilding. The story of this romantic growth from very modest beginnings has now been told in a volume entitled *"100 Years in Steel,"* produced by the firm to celebrate its centenary. The book is splendidly illustrated by portraits of the founders of the firm, and of other great figures connected with it during its century of existence, and by reproductions in colour of photographs and drawings of steel processes of yesterday and to-day.



The 6,000-ton forging press erected in 1911 by John Brown and Company Ltd. This has forged machinery for many famous vessels including the "Queen Mary," the battle cruiser "Hood" and the, new Cunard White Star liner, "No. 552," now on the stocks.

A chronology of the two businesses forms the first part of the book, and this contains many interesting entries. For instance, we read that in 1849 "Sir John Brown invented and patented the conical spring buffer," which added very greatly to the comfort of railway travel. Later we learn that the first crinoline mill to roll steel for crinoline skirts was introduced in 1853.



The world's largest hollow forging, produced in 1932. The illustrations to this article are reproduced from "100 Years in Steel" by courtesy of Thos. Firth and John Brown Ltd., Sheffield.

A short account of the growth of the two firms follows this outline. The men who directed them were far-seeing, as was shown in 1860 when Brown took up the Bessemer process, being the first ironmaster to do so seriously. He soon was able to produce every four hours a mass of cast steel weighing 24 tons. Yet one of the sensations of the Paris Exhibition of 1851, only a few years earlier, was a so-called "monster" ingot of crucible steel, believed then to be the largest ever cast in England, that weighed only 24 cwts. This success was followed by an equally brilliant entry into the production of armour plating for protecting battleships.

Firth Brothers soon became famous for the production of files, tools and crucible steel, and later for guns and projectiles. So the two firms continued, making wonderful progress as they improved their products and introduced new methods of manufacturing them. Increasing business led to extensions and the building of new works, and by the beginning of the present century, when Browns and Firths had been growing up side by side for some 60 years, their works had actually intermixed on the same huge site. It was only natural that the two should be drawn closer together, and in 1903 John Brown and Company acquired a controlling interest in Thomas Firth and Sons.

With this step began an association that has led to rapid expansion and progress. New steels with various special qualities have been produced, among them the famous "Staybrite" acid-resisting steel, and works have been reorganised. Firths now possess an electric steel-making plant that probably is the finest in the world. On the Brown side the Siemens plant has been remodelled to allow the production of ingots of over 200 tons, and the steel foundry at Scunthorpe has been greatly extended. By these and other steps the firm and its associated companies have kept themselves in the very forefront of the steel industry, and this account of their work is indeed a record of the Age of Steel they helped to bring about.

The shipbuilding activities of the firm are of special interest. In 1899 John Brown and Co. Ltd. purchased the Clydebank Engineering and Shipbuilding Company, and have since built many famous vessels. Among these were the Cunarders *"Lusitania"* and *"Aquitania."* The building of the *"Queen Mary"* is a recent triumph, and the firm now have on the stocks at Clydebank the even larger new Cunard White Star liner "No. 552."

Floating Crane on Manchester Ship Canal

Lifting Loads of 250 Tons

NO cranes are more interesting than the giant floating structures of this kind to be seen on the Thames, the Mersey and at other great dock centres. These cranes are invariably of very great power. Their range is much wider than that of large land cranes, for these are either fixed in position, or can operate only in places to which the rails they travel on extend. A floating crane is able to steam majestically to any part of a harbour or dockyard, however, and there can take up the best position from which to tackle the work to be done. This freedom of movement makes the floating crane of the greatest possible value in the construction of ships, in dock and harbour repairs and in dealing with unusual cargoes.

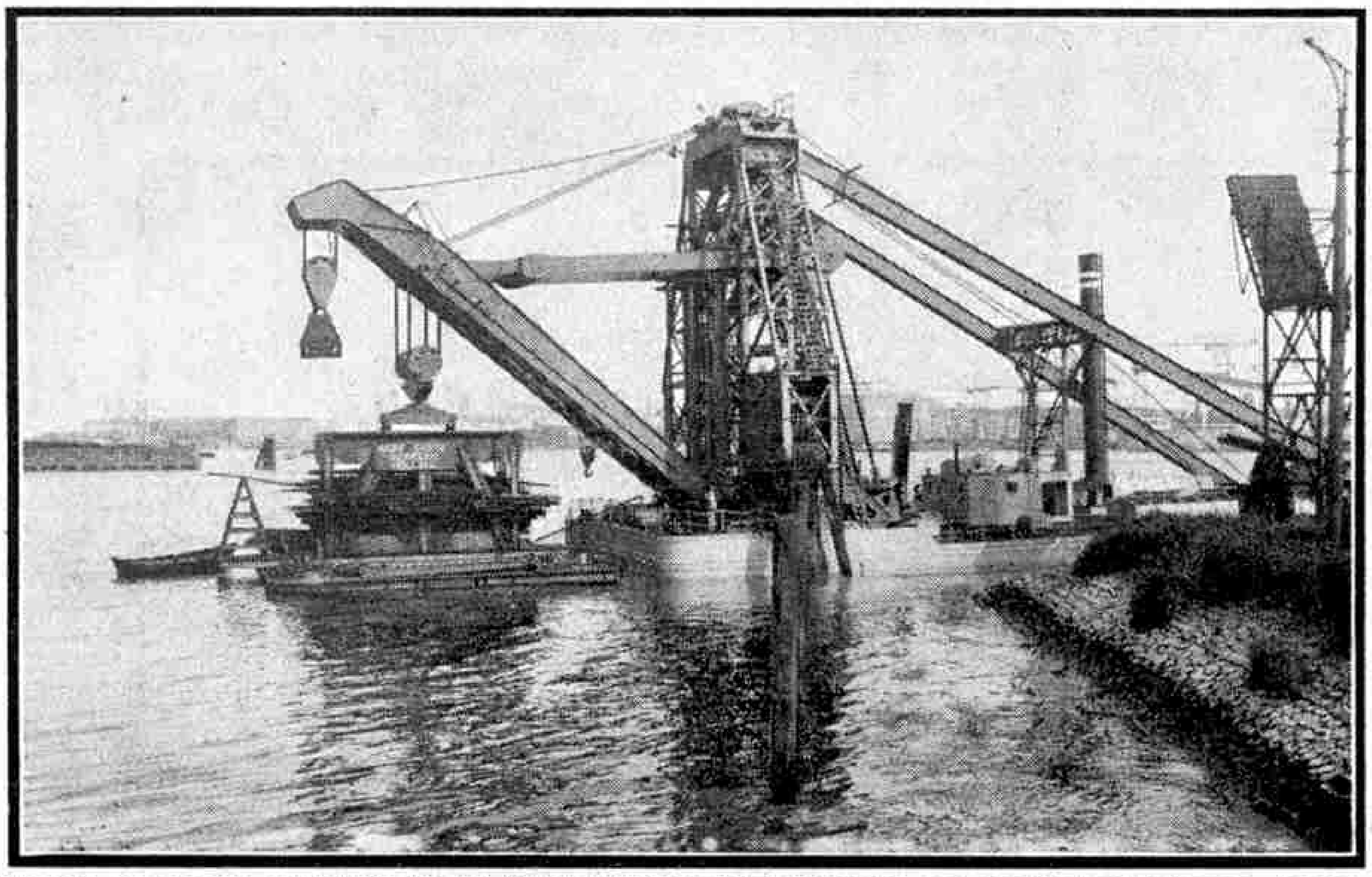
One of the most recent examples of a floating crane is that built for work on the Manchester Ship Canal by Werf Gusto Ltd. (Firma A. F. Smulders), Schiedam, Holland, and shown at work in the illustration on this page. This crane is electric in operation, with a maximum lift of 250 tons, and is equipped with three sets of hoisting tackle, each of which is independently controlled. The two main sets are designed for lifting very heavy loads, such as those met with in salvage work, and for handling lock gates weighing up to 250 tons, while the third set is suitable for dealing with general work and can lift loads up to 125 tons.

The pontoon on which the superstructure of the crane is mounted is 147 ft. in length and 44 ft. 3 in. in breadth. It has a mean unloaded draught of 6 ft. 6 in. The width of the locks of the Canal limit that of the pontoon. It is therefore fitted at its after end with two auxiliary pontoons, which are so arranged that they can be swung outward where space allows in order to give increased support to the main pontoon.

A movable counterweight is provided to maintain the crane on an even keel when the jib is slewing a heavy load. This consists of a heavily-loaded ballast car, which is placed in the aft compartment of the pontoon and can be moved slowly across the end of the pontoon in the opposite direction to that in which the jib is being slewed. Thus the weight of the jib and its load are balanced by that of the ballast car, and there is no tendency for the pontoon to tilt sideways.

The superstructure to which the jib is attached rises to a height of 69 ft. above water level, which is low enough to allow the crane to pass under the various bridges that span the Canal. The jib is mounted in such a manner that it can be used in any one of three different positions. For salvage work on submerged wrecks it is used in its lowest position, that is with its inner end resting on the deck of the pontoon, as shown in the illustration. For handling lock gates the inner end is raised clear of the pontoon deck, so that the jib can be slewed about 15 deg. to port or starboard.

For handling general loads a greater lifting height is required. The inner end of the jib is then raised to its "high" position near the top of the superstructure. The raising and lowering of the jib from one position to another is effected by means of two heavy screwed spindles, which are driven by electric motors. In all positions the reach of the jib can be varied by derricking.



The 250-ton floating crane built for the Manchester Ship Canal Company, and described on this page. In the illustration the jib is shown in position for carrying out salvage work. We are indebted for our photograph to Werf Gusto Ltd. (Firma A. F. Smulders), Schiedam, Holland.

Each of the three sets of lifting tackle is operated by a separate and independent electric motor, the current for which is generated by a dynamo driven by a 200 i.h.p. fast-running steam engine. Steam for the engine is supplied by a coal-fired Scotch boiler at a pressure of 130 lb. per sq. in. The other equipment of the engine room includes various pumps, an electric lighting set, and an air compressor for use in salvage work.

The crane is towed by tugs to the position where it is required to work. In dock it is manœuvred into position by means of wire ropes attached to steam-driven capstans on the pontoon deck and passed round bollards on the quayside.

Spacious and neatly furnished living quarters are provided for the officers and crew. There are messrooms for officers and for the crew, a pantry and a galley, all of which are heated by steam and are well ventilated. The crane is lit throughout with electricity, and the cabins are supplied with running water.

As the crane sometimes has to carry out lifting operations during the hours of darkness, four clusters of powerful electric lights are provided to illuminate the pontoon and the machinery.

The hull of the pontoon and the crane structure were built in accordance with the highest requirements of Lloyd's Register of Shipping and the British Board of Trade.

RAILWAY NEWS

"Snow Trains" in United States

"Snow Trains" is the name given on the New York Central system to the special trains run between New York and districts where winter sports can be enjoyed. The first "snow train" of the current season left New York on 26th December, 1937, bound for the Laurentian Mountains in Canada. This season the New York Central are making a special feature of "Snow Trains." The outward and return journeys are made overnight, on Fridays and Sundays respectively, so that two whole days are available in the sports districts. The trains include an equipment car, where winter sports gear can be hired or purchased. At Grand Central Terminal in New York a special "Log Cabin" bureau handles the bookings and supplies information as to the state of the weather, and the prospects of sport at various points served.

There is also a Sunday "Snow Train," which leaves New York each Sunday morning for the Catskill Mountains and returns in the evening. The train stands by under steam near the sports site until it is required for the return journey, and its dining car service is available for its passengers during the whole day.

From Chicago too, the service afforded by the streamlined Diesel "Denver Zephyrs" and other trains of the Chicago Burlington and Quincy line brings the winter sports districts of the Colorado Rockies within easy reach.

Smart Running by L.M.S. Standard Compound

In the article in the "*M.M.*" last December describing the working of accelerated expresses on the Midland Division of the L.M.S., all the journeys reviewed were made with six-coupled engines. Since then Mr. D. S. Barrie, the author of our article, has timed an interesting run in which the engine was a Standard Compound 4–4–0. These engines are allowed to take up to 220 tons unassisted on the new fast timings, but are only employed when a six-coupled engine is not available.

The journey recorded by Mr. Barrie was with the 10 a.m. Manchester (Central) to St. Pancras express, which is booked to make a non-stop run from Leicester to Luton, 68.9 miles, in 71 minutes. The weather was windy and showery, but with a load of 200 tons gross Compound No. 1083 completed the run in 70 min. 51 sec., the 58.9 miles from Leicester to passing Flitwick being accomplished in exactly one hour. Although a maximum speed of 81 m.p.h. was attained down Sharnbrook bank, the best features of the run were the uphill speeds, including minima of 46 m.p.h. on the 1 in 133 at Desborough North, 50½ m.p.h. on the ascent of nearly three miles at 1 in 120 up to Sharnbrook Summit, and 54½ m.p.h. at the end of over five miles rising at 1 in 202 from near Flitwick to near Leagrave.

The up "Merseyside Express" at the junction of the Manchester and London routes from Liverpool. The engine is the L.M.S. "Turbomotive." Photograph by the Rev. E. Treacy.

The "*East Anglian*" Accelerated

On 3rd January the "*East Anglian*" express was speeded up by 5 min. in each direction, and now travels between Norwich and London in 2 hrs. 10 min. The up train leaves Norwich at 12 noon and reaches Liverpool Street at 2.10 p.m.; and the down train starts at 6.40 p.m., arriving at Norwich at 8.50 p.m.

New Rolling Stock for the L.N.E.R.

The L.N.E.R. has placed contracts for the supply of new passenger carriages, goods wagons and containers. They provide for the construction of 234 third-class coaches of the saloon and corridor vestibuled types, 155 twenty-ton coal wagons, 100 forty-ton timber wagons and 900 containers.

New Coaches for Great Southern Railways of Ireland

On the G.S.R. of Ireland several new coaches of the most modern design, built at Inchicore Works, were put in service for the Christmas traffic rush. Each vehicle is 60 ft. long and is carried on a steel underframe mounted on two four-wheeled bogies.

The body sides, ends and roofs are formed of steel panels secured to teak framing. The windows, except in the doors, are flush with the outside panels and are surmounted by sliding shutter ventilators. These are fitted with wind deflectors to avoid draughts, when open.

Access to the compartments from side corridors is through double sliding doors arranged in conjunction with the large side windows to give an uninterrupted outlook to the passengers. One of the coaches has been fitted with a special air-conditioning plant designed to give an ample supply of fresh air, free from dust and in winter heated to maintain an even temperature.

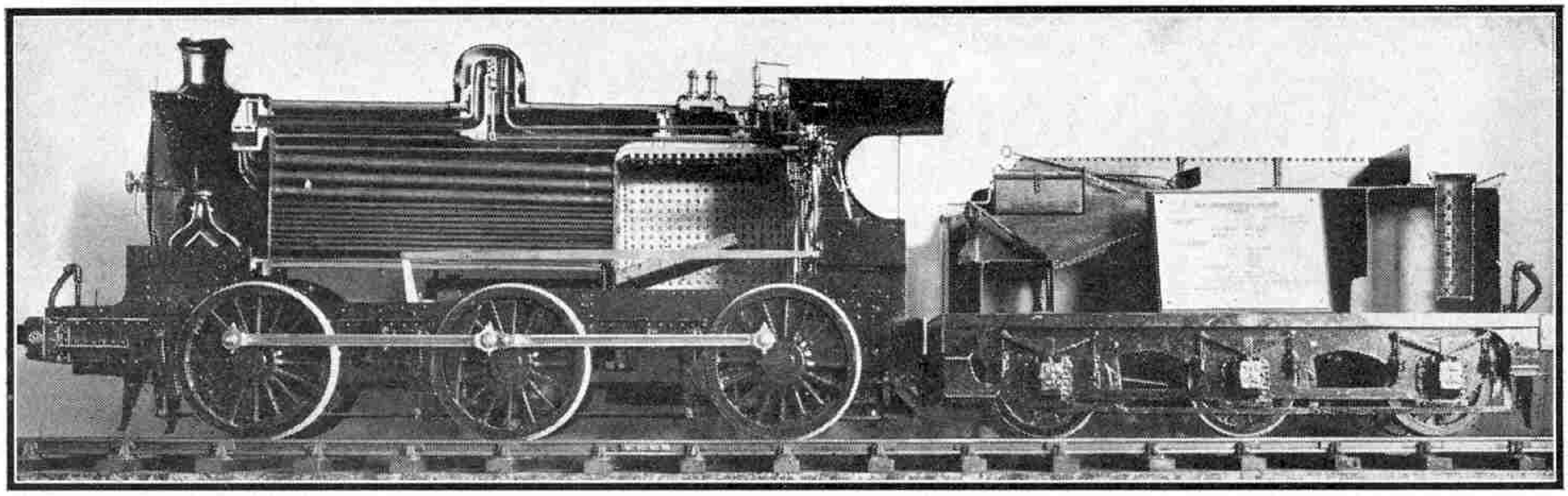
The exterior of the coaches, one of which will be illustrated in next month's issue of the "*M.M.*," is painted in the standard colours of the Great Southern Railways, crimson lake and black and yellow horizontal lining.

Welded Rail Joints on the L.N.E.R.

Recently L.N.E.R. engineers welded together the rails of a section of track 1,260 ft. long, thus forming the greatest length of continuously welded rail in the open in Great Britain. This is in the vicinity of York and so far results have been satisfactory. This experiment was based on the experience gained by the welding of 60 ft. rail lengths into 180 ft. lengths at other points on the system.

Trials also have been made with longer rails at Holme, near Peterborough, where specially rolled rails 120 ft. in length have been laid. These experiments are being carried out with a view to reducing noise and providing smoother travel. They represent a considerable advance in railway engineering practice since the beginning of the century, when rail lengths mostly varied from 30 to 45 ft.

Experiments both with welding and with longer rail lengths are being carefully watched and continued with a view to further developments on the L.N.E.R. and on other systems.



A sectional model of a 0-6-0 locomotive of the G.N.R., Ireland. The model, constructed to a scale of 1½ in. to the foot, represents a G.N.R. engine of class SG3 and is used for instruction purposes by that Company. Details include the firing tools in the tender. Photograph by courtesy of the G.N.R., Ireland.

Progress in Electrification Schemes

The track equipment has been modernised on the L.N.E.R. electrified lines between Newcastle and the coastal towns of Tynemouth, Whitley Bay, and Cullercoats, together with the loop line known as the Riverside Branch. New rolling stock also has been provided to maintain accelerated services. The number of new vehicles is 132, and 74 old ones have been scrapped.

The new service commenced on 3rd January, and big reductions were made in the times for various journeys. As the result of this modernisation, the electrified lines radiating from Newcastle are among the most up-to-date in the country and the new carriages, which are of steel construction, set an entirely new standard in comfort for suburban passengers. They are finished externally in red and cream.

In the meantime, the extension of the electrification from Newcastle to South Shields is proceeding rapidly. The third rail has been electrified and leakage, continuity, bonding and other tests have taken place. In addition, trials have been run over this 11-mile long branch with eight-coach electric train sets.

It is anticipated that the full service between Newcastle and South Shields will be in operation early this year, reducing the journey time from 33 or 34 min. to 27 min.

Contracts have been placed with the Metropolitan-Vickers Electrical Company Ltd., for the design, manufacture and erection of complete electrical equipments for 70 mixed traffic locomotives required in connection with the L.N.E.R. Manchester and Sheffield electrification scheme. The mechanical portion of the locomotives, comprising the underframe, superstructure and motor bogies, will be built by the L.N.E.R.

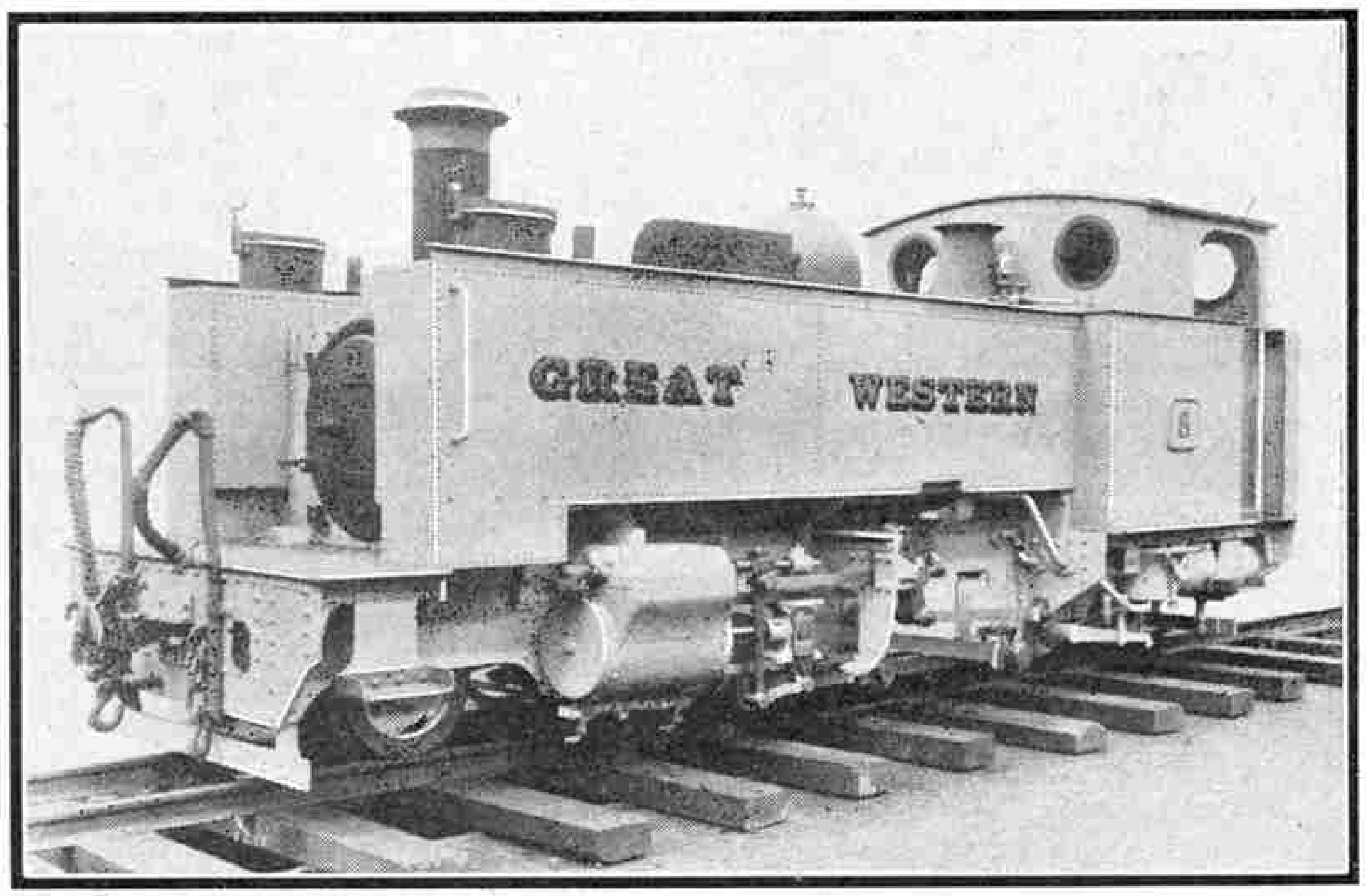
It is intended that the mixed traffic locomotives shall be used for all classes of traffic, except the express passenger trains, for which express type electric locomotives will be required.

In preparation for the introduction of electric services on the L.M.S. Wirral line, Hoylake, New Brighton, Moreton, Leasowe, Meols and West Kirby stations are being rebuilt. At Hoylake the old buildings have already been demolished and a new concrete structure and concrete footbridge erected. The design of the station entrance at Hoylake has already caused much comment among residents. The new stock for the Wirral electrification is in course of delivery and at the time of writing some trains have already been used on tests.

The Remodelling of Euxton Junction

When the work is completed on the track through Euxton Junction, on the L.M.S. main line between Wigan and Preston, the restriction to 60 m.p.h. hitherto in force at this point on the fast lines will be lifted and speeds up to 90 m.p.h. allowed. This will favourably affect the running of the through Scottish expresses, and will also slightly affect the line to and from Chorley in a similar manner.

These improvements are being carried out on Sundays to interfere as little as possible with the heavy normal traffic. They have been made possible by the re-alignment of the curves of the fast lines. Additional cant has been provided by the introduction of special two-level chairs of the type referred to in the article in the October 1937 "*M.M.*" on "*Why Trains Heel Over.*" These will ensure still smoother running and travel comfort at maximum speeds.



A diminutive G.W.R. tank locomotive. This little engine is in service on the Vale of Rheidol line, a narrow gauge branch from Aberystwyth to Devil's Bridge. Photograph by courtesy of the G.W.R.

New Stock for G.W.R. Narrow-Gauge Line

The G.W.R. are replacing practically the whole of the passenger rolling stock that is used during the summer months on the Vale of Rheidol line. This is a branch line with a gauge of 1 ft. 11½ in., which runs from Aberystwyth to Devil's Bridge and is considered one of the finest scenic railways in the country. During the course of its 12 miles, the line rises to 680 ft. above sea level. Ordinarily it takes an hour to cover this journey.

The new rolling stock includes 10 third-class coaches, and two third-class brake vehicles. In addition there will be three four-wheeled brake vans. The vehicles, which are being constructed in accordance with the latest practice for standard gauge stock, are 32 ft. long and 6 ft. wide. The combined central buffer and coupling that is usual on narrow gauge railways is to be fitted. This type of coupler is shown in the lower illustration on this page.

L.M.S. Railway Centenaries in 1938

Foremost among important centenaries that the L.M.S. will celebrate this year is that of the opening throughout of the whole line of the London and Birmingham Railway, which was the first main trunk line. The earliest section was opened in July 1837, but the line was not completed throughout until 17th September, 1838. Proposals for the celebration of this important event are receiving the consideration of the L.M.S. authorities.

Another important centenary that falls this year is that of the opening in October 1838, of the North Union Railway from Wigan to Preston. As a result of this opening, continuous railway communication was established between Euston and Preston via Birmingham. The direct Trent Valley line was not opened until 1847.

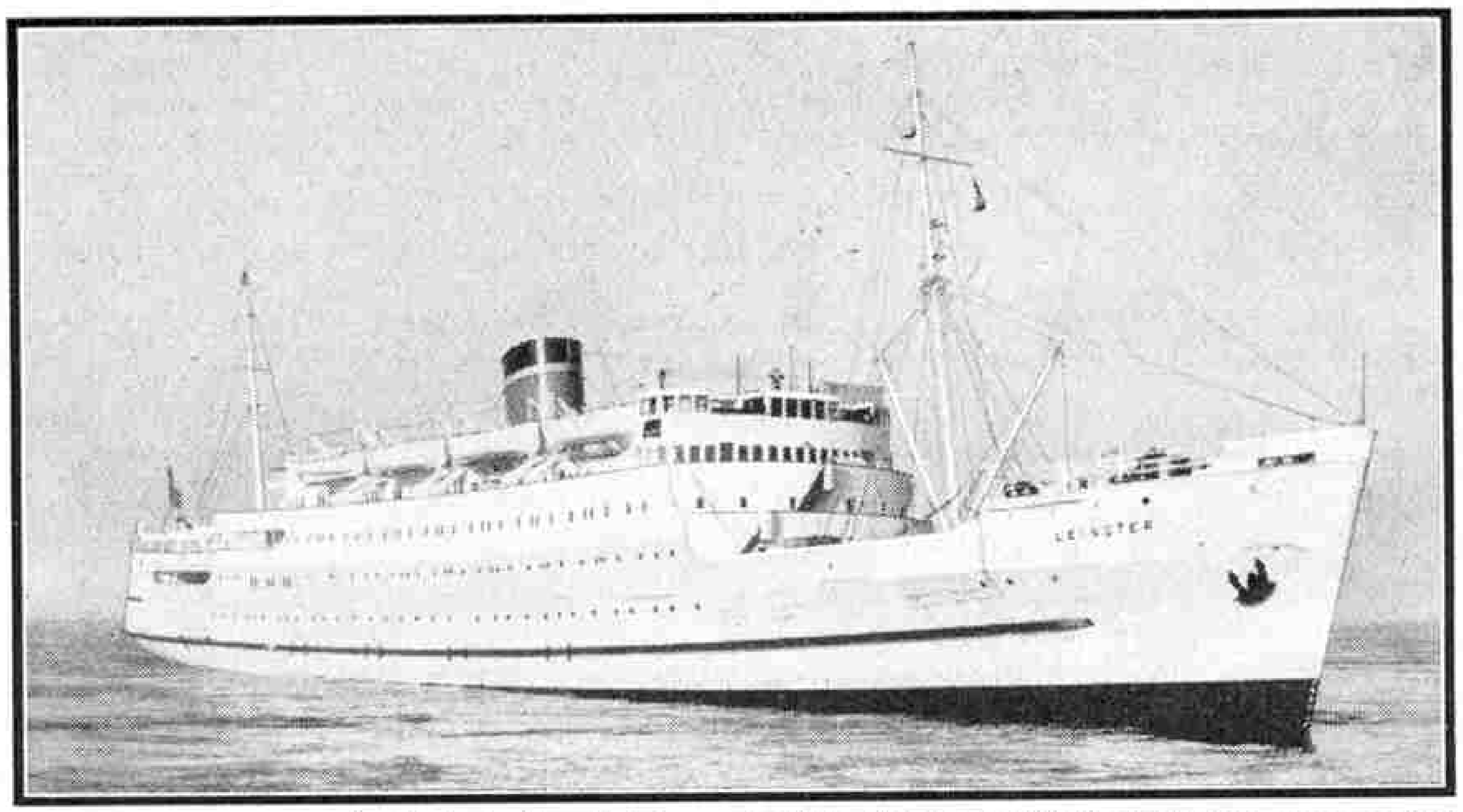
In May there occurs the centenary of the opening of the Manchester and Bolton Railway, which was the first completed section of the afterwards extensive Lancashire and Yorkshire Railway system, and in October falls the centenary of the opening of the Sheffield and Rotherham Railway.

The Motorship *"Leinster"*

New Vessel on the Liverpool-Belfast Service

MUCH less is heard of the ships operating on the many cross-channel services round the coast of Great Britain than of the giant liners of the transatlantic service, and of other routes across the oceans. Yet there is no essential difference between the liner and the cross-channel vessel except in regard to size. The smaller vessels are comfortable and speedy, and their runs demand at least as much care on the bridge and in the engine room as in the ocean giants, for they pass through more crowded and tortuous waterways and have to keep to scheduled times.

A good ship is a necessity if a cross-channel service is to be maintained successfully. A splendid example of a modern vessel designed for such work is shown in the illustration on this page. This is the *"Leinster,"* which was built at Belfast by Harland and Wolff Ltd., and after successful trials was handed over to her owners, The British and Irish Steam Packet Co. (1936) Ltd., on 3rd November, 1937. She is now engaged in the overnight service between Liverpool and Belfast. A sister ship, the *"Munster,"* was launched on the day on which she was accepted. This vessel is at present being fitted out at Belfast and when ready will join her sister ship in the Liverpool-Dublin service, to which the *"Leinster"* will be transferred.



The twin-screw motorship "Leinster," which is employed in the night services across the Irish Channel between Liverpool and Belfast. Photograph by B. and A. Feilden, Blundellsands, Liverpool, 23.

The *"Leinster"* is a handsome vessel, with a well-raked plate stem, cruiser stern, raked masts and a single low streamline funnel. Her good appearance is added to by the attractive colour scheme employed. She has a hull of light buff colour, with white deck housings, and her funnel is red, with a narrow blue ring below a wider black one at the top. While in port at night the funnel is usually illuminated by means of floodlights.

The overall length of the vessel is 367 ft., and she has a moulded breadth of 50 ft. and a gross tonnage of about 4,320. There are five principal decks, providing ample accommodation for all purposes. The hull is subdivided into watertight compartments by eight bulkheads that extend up to the main deck. There are three general cargo holds, two of which are forward of the engine room and one aft. The double bottom is suitably arranged for the carriage of fresh water ballast and oil fuel. A semi-balanced streamline rudder is fitted aft for regular use, and a bow rudder also is provided to increase the manœuvring ability of the vessel when moving astern.

Channel steamers have to dock under their own power, and moor alongside piers, landing stages and quays of various types, and it is therefore necessary to provide efficient permanent fenders. The main fender of the *"Leinster"* extends from well forward right around the stern, while further belting is fitted to the stern at a higher level, as can be seen in the illustration.

The vessel is propelled by twin engines of the Harland-Burmeister and Wain airless injection type. Each engine has 10 cylinders, and is designed to give an output of 3,000 b.h.p. at 145 r.p.m. Automatic starting is provided, and the cylinder heads and jackets of the engine are fresh-water cooled.

The auxiliary machinery is largely electrically driven by current produced by 3 D.C. generators, each of 175 kW capacity at a speed of 300 r.p.m. Each generator is coupled directly to a six-cylinder Diesel engine working on the two-stroke cycle.

The accommodation in the *"Leinster"* is of exceptionally high standard, especially in the case of the first class. The vessel operates in an overnight service, arriving at her destination about breakfast time. Her accommodation and services therefore are specially designed to meet these conditions. Particular care has been taken to avoid the possibility of crowding in the parts of the vessel set apart for passengers, and to this end extensive promenade spaces have been arranged in both first and third-class.

Altogether 425 first-class passengers can be carried, over 100 in single-berth state-rooms and the rest in rooms with two berths. There is a restaurant, attractively decorated, with seating for 64 persons, and at the forward end of this is a shop with side display windows.

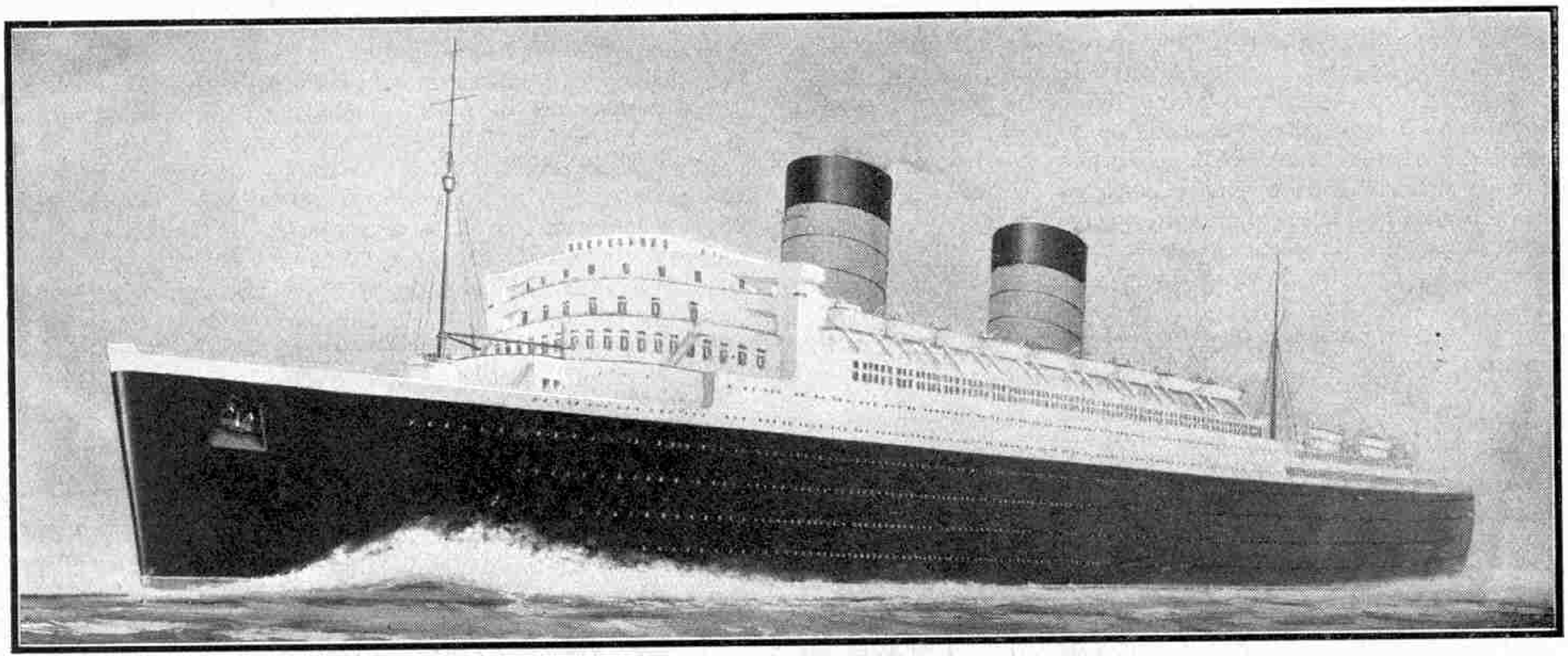
The third-class spaces will accommodate 1,075 passengers, and include two-berth and four-berth rooms, with large public rooms and sleeping apartments.

Electric heaters of a special type are fitted throughout the passenger accommodation, and the filtered air used for ventilation also can be preheated. Electrically-driven fans discharge this air through diffusers into the public rooms, and through louvres that can be adjusted into the cabins and state-rooms. Fire-detecting apparatus is fitted, and extinguishers are incorporated, one in the cargo spaces and an automatic sprinkler in the passenger section.

The *"Leinster"* has now been in service for more than two months, and her comfortable accommodation and excellent behaviour in all conditions have made her a very popular vessel.

The New "*Mauretania*"

A Great Liner in the Making



IN the shipyard of Cammell Laird and Co. Ltd., Birkenhead, to the thunder of hundreds of riveting machines, the great new Cunard White Star liner "*Mauretania*" is rapidly taking shape. She is rising on the slipway that saw the birth of the "*Samaria*," the battleship "*Rodney*" and the aircraft carrier "*Ark Royal*," and such rapid progress has been made in her construction since her keel was laid down last May that even now it is possible to visualise her graceful lines and massive size.

The "*Mauretania*" will be some 750 ft. in length, with a gross tonnage of about 33,000. She will embody in her design all the newest ideas in marine engineering and naval architecture, in this way providing greater facilities for the enjoyment and comfort of those who will travel in her. An outstanding instance of this is shown in the fact that the vessel will have only two funnels. At one time at least four funnels would have been required for a liner of this immense size, but marine engineering has progressed to such an extent, that to-day two funnels can easily do the work of four. This means that in the new "*Mauretania*" it has been possible to increase the deck space for games and promenading, and to add to the interior accommodation of the vessel.

The illustration on this page is from an artist's drawing of the Cunard White Star liner "Mauretania," now being built at Birkenhead. This vessel will be of 33,000 tons gross, and will be the largest ever constructed in an English shipyard. Photograph by courtesy of Cunard White Star Limited.

The liner will be a twin-screw vessel driven by Parsons single-reduction geared turbines. Steam will be supplied from high-pressure water tube boilers. Three classes of passenger accommodation will be provided. They are Cabin, Tourist and Third Class, and for all classes the scale of accommodation will be on spacious, up-to-date lines.

An idea of the size of the vessel can be obtained from the fact that there are 10 decks. These include a sports deck and a sun deck, giving good space for open-air activities in all classes, and in addition there will be an unusually large number of sheltered promenade spaces available for passengers.

Everything possible in modern ship construction is to be done to make the "*Mauretania*" a really popular liner, and to meet present day demands. She will have no fewer than 20 public rooms, several of which are to be ventilated on the "conditioned air" system. The spacious promenade deck will be given up entirely to a series of magnificent rooms for cabin passengers, and will include an observation lounge. Also on this deck there are to be a beautifully decorated ballroom, a shopping "centre," lounge, smoking room, writing salon, library, children's room and facilities for the exhibition of cinema films.

The spaciousness of the ship will allow for the provision of a large number of "outside" rooms, that is rooms with an outside porthole, in the tourist class as well as in the cabin department.

The cabin dining-room will be 80 ft. in length and will extend the whole width of the vessel, as will also the tourist dining-room. A large electric power station will operate the hotel services, and in fact, with the exception of the propelling machinery, the "*Mauretania*" will be an all-electric ship.

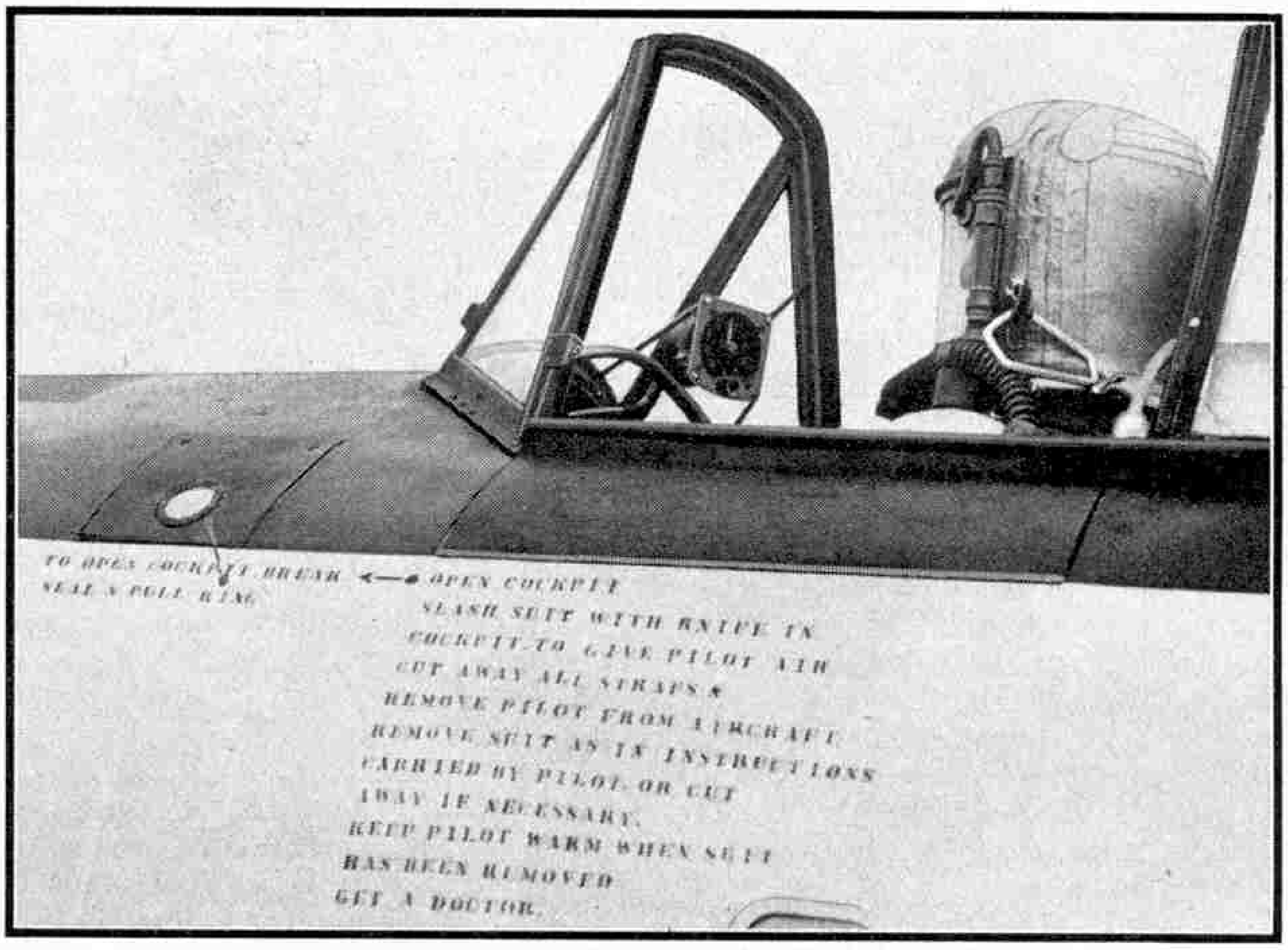
Work on the liner is proceeding day and night, and eventually about 5,000 men will be employed at the Birkenhead yard in bringing the largest liner ever built in England into being. In addition to these 5,000 men, a large number of trades throughout the country will be affected, and it is computed that by the time the "*Mauretania*" is completed about 150,000 people in 100 cities and towns will have taken some part in her construction, furnishing and equipment.

The vessel will be launched on 28th July, and is expected to enter service during 1939.

Britain Retains World Altitude Record

Triumph of Bristol 138a Monoplane

THE world aeroplane height record of 53,937 ft., or just over 10¼ miles, made by Flight Lieut. M. J. Adam, R.A.F., on 30th June last year, has been officially confirmed by the Féderation Aéronautique Internationale, the governing body in connection with aeronautical records. The new record exceeds by 3,993 ft. the previous one, which stood at 49,944 ft. and was set up by Squadron Leader F. R. D. Swain, R.A.F., on 28th September, 1936, in the same Bristol 138a monoplane with the same Bristol engine. It also surpasses by 2,573 ft. the height reached by Lt.-Col. Mario Pezzi, Chief of the High Flying School of the Regia Aeronautica, Italy, on 7th May, 1937.



Flight Lieut. M. J. Adam in the cockpit of the Bristol 138a monoplane. Emergency instructions for the guidance of rescuers in the event of the aeroplane crashing are painted on the outside of the cockpit. The illustrations to this article are reproduced by courtesy of "Flight."

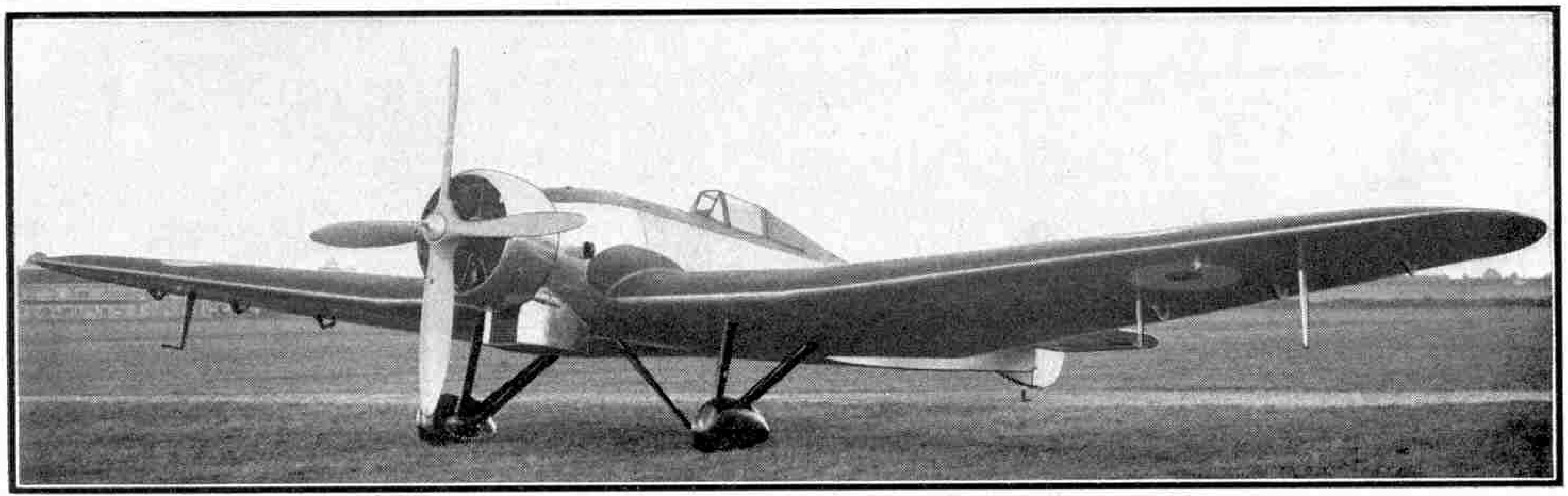
The two British flights are the only two occasions on which this record has been achieved by an aeroplane and engine produced entirely by one firm, and the two events provide the only instance of the record being established twice by the same aeroplane. The record flight of Squadron Leader Swain was sufficient to prove the excellence of the Bristol 138a monoplane and its engine, and was of particular significance in "metric" countries because for the first time an aeroplane had flown higher than 15,000 metres.

This performance did not satisfy the British technicians, however, as the designed practical ceiling of the aeroplane was 54,000 ft. For Flight Lieut. Adam's attempt, therefore, small changes in carburation and airscrew pitch were made, and other slight modifications included the fitting of smaller wheels to diminish weight and head resistance, and the removal of the wheel brakes to save weight. These alterations enabled the engine to deliver its full power in the later stages of the climb, and the aeroplane to justify the calculations of its designers. The attempt was preceded by six or seven trial ascents, in each of which the aeroplane climbed to about 50,000 ft. The experience thus gained proved invaluable on the record flight which was made in a gale rising to nearly 100 m.p.h. high above the Earth.

Flight Lieut. Adam took off from the aerodrome at Farnborough, Hants, at 5.40 a.m. There was a clear sky and practically no wind at low altitudes, and he began his flight in a south-westerly direction. At 7,000 ft. a cloud layer forced him to head back east. He was completely blinded by the sun, which was very low at that hour, and it was impossible for him to see his instruments. He therefore turned and climbed steadily in a north-easterly direction to a height of 20,000 ft. over Staines. At 25,000 ft. visibility became very bad on account of the clouds, and the ground could only be seen through one or two small gaps. The pilot's last recognisable landmark as he climbed steadily into the stratosphere was Rochester, so that the position of the aeroplane was then a little north-east of London, at about 35,000 ft.

"At this height," states Flight Lieut. Adam in his report, "the engine was running very smoothly and the auxiliary blower was engaged. At 38,000 ft. very slight frost began to form on the inside of the cabin, but this was not serious. It formed on the hood and the windscreen as well. At 50,000 ft. I had not seen the ground for about half-an-hour, so having decided the wind was north-westerly I maintained this course until I reached my ceiling. I now saw that my altimeter was registering over 55,000 ft. and the rate of climb of the machine had decreased to practically nothing. I realised that in all probability I had broken the record by a substantial margin, so I decided that it was advisable to begin my descent.

"I closed the throttle and switched off the engine, and from that time until I landed I did not use the engine again. The rate of the machine's descent was very slow. I had, therefore, to force the nose downward, and held the aircraft at an indicated speed of about 150 m.p.h.; my true speed, of course, was very much higher. At 25,000 ft. I passed through a cloud layer and got my first glimpse of the ground. I had an idea I was in the vicinity of Bristol. I therefore continued to descend in a north-easterly direction, and passing through a second layer of cloud at 15,000 ft. I saw a river which I recognised a few minutes later as the Thames, near Staines. I headed for Farnborough and landed on the aerodrome, without any trouble, at five minutes to eight." The



The Bristol 138a low wing monoplane in which world aeroplane height records have been achieved by Squadron Leader Swain and Flight Lieut. Adam, both of the R.A.F.

ascent to the record height of 53,937 ft. took 1 hr. 35 min., and the total flying time for the attempt was 2 hrs. 15 min.

Flight Lieut. Adam was clad in a special sealed high pressure suit supplied with oxygen, similar to the one used by Squadron Leader Swain. These suits can be inflated to a pressure adequate to sustain life at any altitude, and are essential, as at heights above 43,000 ft. it is necessary to resort to some means of artificially increasing the pressure in the lungs. At the conclusion of the flight the pilot stated that the heating system had been perfectly satisfactory, and that he had not experienced any physical difficulty.

The origin of the aeroplane used for these record altitude flights is interesting. In 1934 the Air Ministry placed an order with the Bristol Aeroplane Company for the design and construction of an aeroplane suitable for flights at levels of 50,000 ft. and over. It was to be used as a high-flying laboratory to gain experience in the operation of aircraft and the working of engines, equipment and instruments in the tenuous atmosphere and severe cold of high altitudes. The starting point in the design was a general investigation as to whether the biplane or monoplane type seemed more promising, and this ended in favour of the monoplane. The next question was whether the aeroplane should be a low wing or high wing one. It had to be designed to be convertible to a two-seater, and this meant that the observer must be as near the centre of gravity as possible, and that there must be a reasonable view for both occupants, and facilities for getting out with parachutes. It was found that the high wing type did not promise a very satisfactory layout to meet these conditions. A medium wing design was then tried, but here again it was found that the wing restricted the landing view of the pilot; therefore the design was almost forced to be low wing as the best compromise to meet all requirements.

Wood construction was decided upon because it was felt that the soundest and best finished job could be made in this material for an original hand-made experimental aeroplane, and as plywood has better insulating properties than thin sheet metal the weight of the necessary special insulation against cold wind would be reduced. The two outer wings of the Bristol 138a are bolted to the centre section, and are covered with plywood sheeting of extreme thinness, in some parts only 0.8 mm. thick. A pair of special "surface" engine-oil coolers were designed to form the leading edge of the wing centre section on each side of the fuselage, and the scavenge pump forces the oil in series through the pair of coolers on its way back to the oil tank.

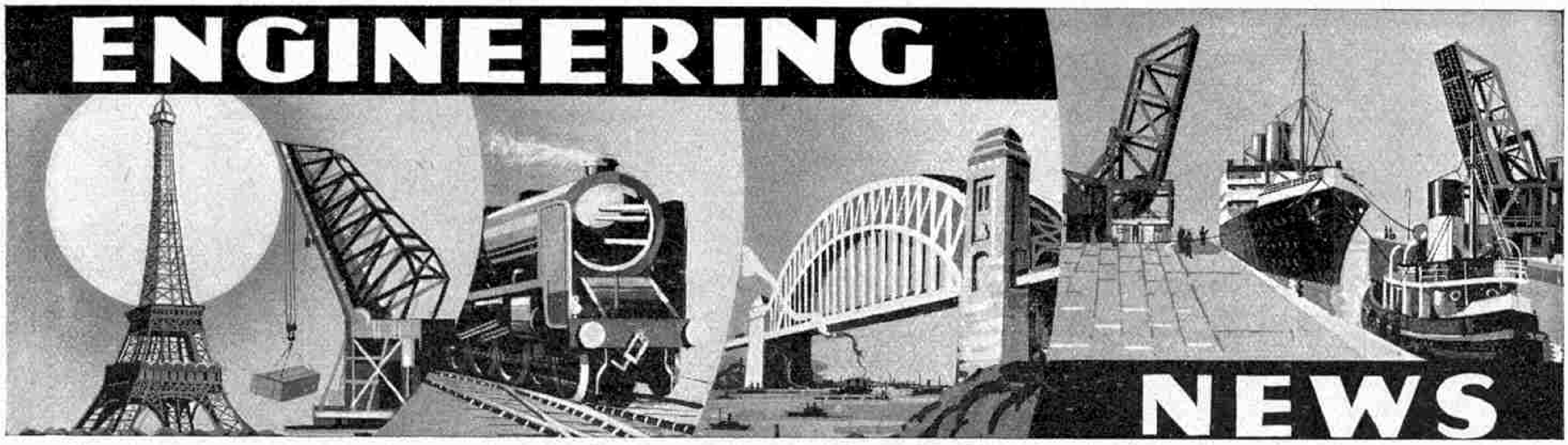
Flight Lieut. M. J. Adam, R.A.F.

The fuselage is a rectangular monocoque of wooden construction, with a plywood skin glued and screwed through the mahogany corner longitudinals and stiffener struts. The forepart consists of the engine mounting and tank bay, with a fireproof bulkhead at each end. The pilot occupies an enclosed cockpit aft of the rear wing spar and well insulated from cold, and warmed by air flowing past the engine oil coolers in the wings. The cockpit has a transparent sliding roof that can be instantaneously released in case of emergency. In addition to the many standard instruments there is an altimeter specially arranged to read up to 60,000 ft., so that the pilot may know his approximate height. In some previous high altitude attempts there have been narrow escapes from disaster due to the controls, which have been lubricated by grease, freezing up. In the Bristol 138a all the controls are fitted with ball bearings, and no grease caps or nipples are provided. The joints and bearings were dipped in thin gun oil, drained off, and then fitted in locked and sealed compartments to prevent greasing, which might jeopardise the safety of the aircraft in very low temperatures.

The engine is a special unit of the Bristol "Pegasus" series, known as the P.E. VI S. It is fitted with a special two-stage blower that enables it to develop its maximum power at a great height. A four-bladed wooden airscrew is employed, the pitch of which has been developed from observations at high altitudes.

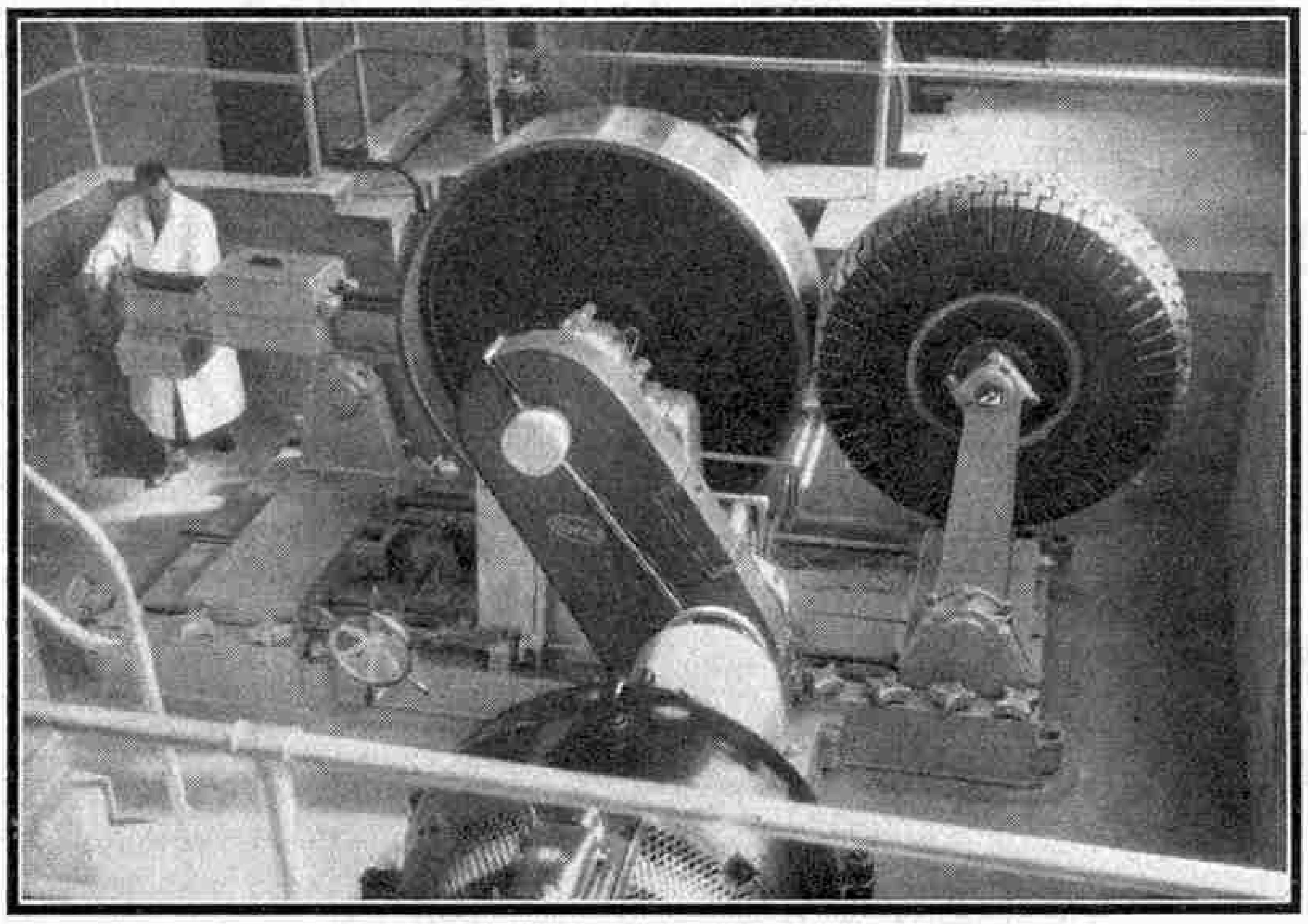
The Bristol 138a is 66 ft. in span and 44 ft. long, and is one of the largest single-seater aeroplanes ever built.

ENGINEERING NEWS



Testing Giant Motor Tyres

For testing commercial motor tyres of all sizes engineers of the Dunlop Rubber Company have designed the machine shown in the illustration on this page. The apparatus is 7 ft. high and occupies 350 sq. ft. of floor space in a pit 4 ft. 6 in. deep. With it commercial tyres of all sizes are tested by pressing them against a revolving steel drum with a force of up to 10 tons. The drum is 5 ft. in diameter and 16 in. wide, and is driven by a 44 h.p. electric motor at any desired speed up to one equivalent to 45 m.p.h. on the road. While in the machine the tyres are subjected to more severe conditions of load and temperature than are ever likely to be met in actual service.



A machine at Fort Dunlop that tests giant pneumatic tyres under loads up to 10 tons, and at speeds as high as 45 m.p.h. Photograph by courtesy of the Dunlop Rubber Co. Ltd., London.

When desired, actual road conditions can be faithfully imitated, for a special blower is fitted to direct a current of air on to the tyre during test. This gives the same cooling effect as the wind created by a vehicle's motion.

Large Drums Floated to Destination

Four huge drums for a large coking plant at Whiting, Indiana, in the United States, were recently transported by water from Jersey City, a distance of over 1,370 miles. Each drum weighs 78 tons, and is 60 ft. long by 16 ft. in diameter, and their size made it impossible to carry them by road or rail. The drums therefore were sealed, launched into New York Bay lashed in pairs, and then towed to their destination. On their way they passed up the Hudson River and through the New York State Barge Canal, then crossing in turn Lakes Erie, Huron and Michigan.

A huge tower for the plant, 80 ft. long, 15 ft. in diameter and weighing 205 tons, is to be transported in a similar manner.

A New Alloy for Making Metal Foil

Foil made from a zinc alloy may become a serious competitor with the aluminium and lead-tin foils now largely used in wrapping various commercial commodities. Foil made from the new alloy is reported to be stronger than that made from lead-tin, and to have a brilliance comparable with that of aluminium or tin foil, and it is claimed that a pound weight of the alloy can be rolled into 14,000 sq. in. of foil.

Extending Hong Kong's Water Supply

All the reservoirs in the Colony of Hong Kong, including that created by the Shing Mun Dam, are full with water running over, yet the Hong Kong Government has decided to spend another three million dollars in extending its water supply service. The most interesting part of the new work will be the laying of new and bigger pipes across the harbour, a distance of 5,700 ft., in order to convey necessary supplies of water from the mainland to the island of Hong Kong itself.

The first pipe line was composed of lap-welded steel pipes, each 12.265 in. inside diameter and about 20 ft. in length. The pipes were welded locally into lengths of about 100 ft., and have steel ball and socket joints at intervals of 300 ft. to allow for changes of line and level of the pipe. The pipe is held in position by specially cast concrete blocks weighing about 17 tons.

A Pioneer Double-Deck Trolley Bus

The world's first six-wheel double-deck trolley bus fitted with pneumatic tyres was put into service at Wolverhampton in December 1926. It comprised a 61-seater body mounted on a Guy 15-7 W.B. type six wheel chassis, and recently made its final journey after 11 years' service. It is now to be added to a collection of representative types of Guy vehicles produced during the last 25 years that forms an interesting exhibit at the works of Guy Motors Ltd.

New 720-Ton Rolling Lift Bridge in London

The London County Council is rebuilding nine road bridges in order to improve the approaches to the docks in London. The fifth of these to be completed is a rolling lift bridge that carries Glamis Road, Stepney, over the entrance lock to the Shadwell New Basin, where it has replaced a single-track hydraulically-operated bridge that was only 15 ft. 6 in. wide.

The new bridge is 40 ft. wide, including a 7 ft. 6 in. footpath on each side of the 25-ft. carriageway. Its length is 70 ft., and the weight of the moving span, the end of which rises 100 ft. above ground level, is 720 tons. Mechanical and illuminated electric indicators are provided to show the operator the exact position of the bridge while it is being raised or lowered, and in addition he can watch what is happening through the window of the control room.

The movements of the bridge are carried out by means of a master controller. Placing the handle in the first opening notch automatically sounds warning gongs at the approaches to the bridge and illuminates traffic signs, which display first the words "Gates closing," followed after a short interval by "Stop here." In the meantime the road gates are freed by their mechanical keys, after which they are closed by hand. The visual indicator in the control cabin then shows "Gates Closed."

When the control handle is moved to the second opening notch a 1.5 h.p. motor in the nose of the bridge automatically withdraws the locking bolt and then stops itself. Movement to the third notch starts one or both of the main lifting motors, the movement at first being carried out at creeping speed. When nearly open the bridge again slows down to creeping speed, ready to stop itself in the fully raised position, and electric and mechanical bells warn the operator. A somewhat similar sequence of operations is carried out when the bridge is lowered.

Vehicular Tunnel Under the Kiel Canal

Plans are now being prepared for the construction of a tunnel under the Kiel Canal for the purpose of linking up the two sections of the new motor road from Hamburg to Flensburg, on the Danish-German frontier.

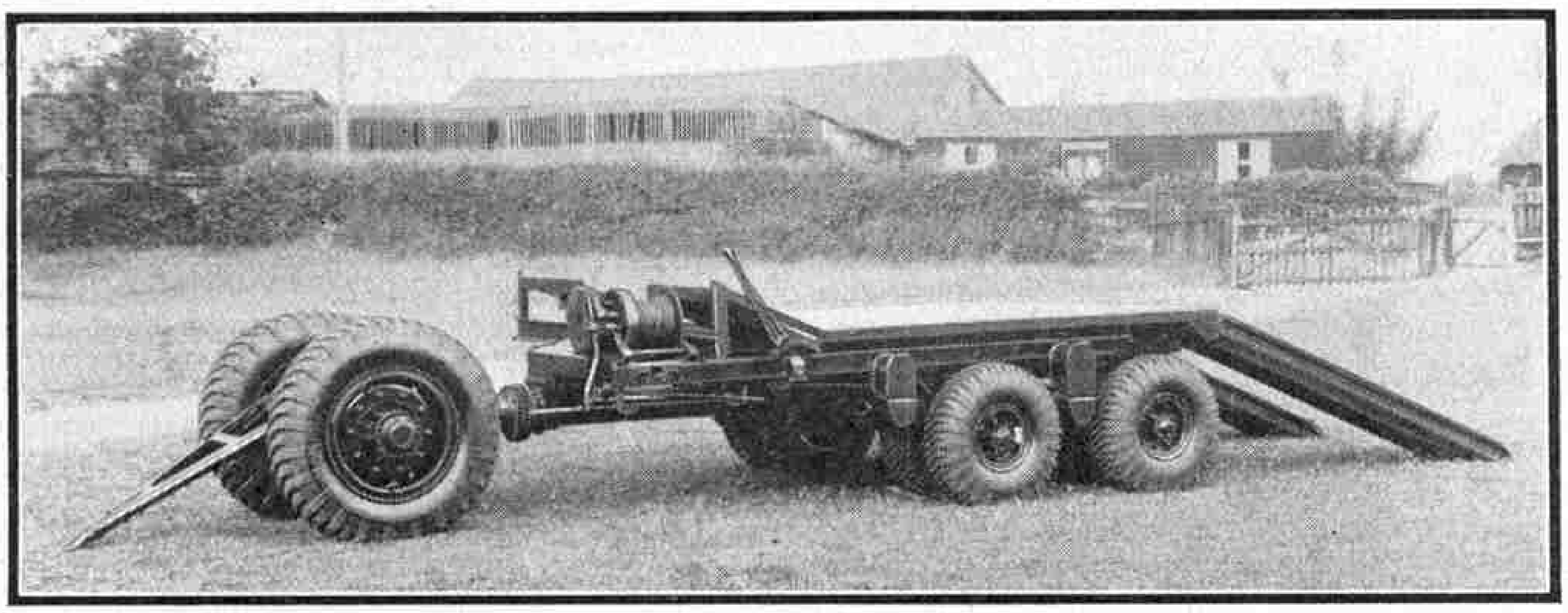
A Trailer for Carrying Army Tanks

A novel trailer, the chief features of which are stability when travelling over rough country, low loading height and flexibility, has been designed by Cranes (Dereham) Ltd., Dereham. It is intended for carrying Army tanks and is shown in the upper illustration on this page.

The platform of the trailer is mounted on 10 pneumatic-tyred wheels, each fitted with brakes, and is designed to carry loads up to five tons. Wheels of small diameter are used at the back in order to obtain a low platform, and these are mounted in a special form of suspension. They swing in a vertical plane about points in front of and above their centres, and are interconnected in such a manner that load transference during articulation and braking is limited.

The brakes are applied by "overrun" action on all wheels, the retardation of the front bogie being used to apply the brakes on the rear wheels. Full trailer braking is thus obtained without intercoupling of the tractor and trailer brakes.

A winch for hauling purposes is fixed to the front of the vehicle, and two light loading ramps are provided at the back. The distance between the two ramps can be adjusted to suit different track widths. Damaged tanks can by this means be loaded quickly under all conditions of active service. In complete working order the trailer weighs 46 cwt.



A novel trailer for transporting army tanks, with the ramps by means of which the tanks are loaded in position. It was manufactured by Cranes (Dereham) Ltd., Dereham, to whom we are indebted for our photograph.

Spraying Bearings with Molten Steel

Worn bearings and journals in machinery can now be repaired and built up to the original diameter by spraying them with a fine jet of molten steel. Recently a series of interesting tests have been carried out to ascertain the wearing qualities and other characteristics of bearings treated in this manner. These were made under working conditions on the crankshafts of 22 different engines, of which five were from private motor cars. The crankshafts on half the journals were reduced in diameter, and then built up to the full size by spraying on steel to a thickness of about 1/16th inch. Checks of the wear on the metal-sprayed journals and on the ordinary journals were made over various running distances up to 15,000 miles, and when the engines were taken down for inspection it was found that in no case did the wear on the sprayed journals exceed that on the ordinary journals. The difference in the thickness of metal spraying appeared to have no influence on the wear, and the bearings of the sprayed journals were less worn than those of the unsprayed journals.

Novel Fire and Explosion Tests

A demonstration was recently given of the strength and fire-resisting qualities of roofing sheets and fire-protection panels manufactured by Durasteel Roofs Ltd. The roofing sheets made by the company at their works, Greenford, Middlesex, consist of a core of cold-rolled steel sheets covered with a protective bituminous coating and faced on each side with an asbestos sheet. The fire-protection panels consist of an asbestos composition sheet secured between two sheets of steel or other metal, and are made in three standard thicknesses of ⅛ in., ¼ in. and ⅜ in. respectively.

In one test the fire-resisting properties of a ¼ in. thick steel plate were compared with those of a ⅜ in. thick "Durasteel" panel, by placing 3 lb. of thermit on each and igniting the two quantities at the same time. The material burned right through the steel plate in nine seconds, but after the thermit on the "Durasteel" had burned out the surface of the panel was only pitted, and considerably more thermit would have been required to burn through it.

In another test a heap of wood soaked in petrol was ignited in a small building consisting of a timber framework covered inside and outside with ⅜ in. "Durasteel" panels. At the end of five minutes the maximum temperature of 670 deg. F. was reached inside the structure and yet the outside panels were barely warm. Water was then sprayed on the fire and the walls of the structure in order to cool them as quickly as possible, and examination then showed that the panels were neither blistered nor pitted as a result of the great heat and the sudden deluge of water.

Explosion tests were then made in three small chambers, the walls of which were of different materials. The walls of the first chamber were covered with 6-in. corrugated asbestos sheets, and the explosion in it of a charge of ½ lb. of blasting powder completely shattered them. The second chamber was walled with standard "Durasteel" corrugated roofing sheets, and its sides bulged about 3 in. in the centre and slight surface cracks appeared on the outside when a similar quantity of blasting powder was exploded in it. The third test was made in a chamber walled with ⅜-in. "Durasteel" fire-protecting panels. The charge was increased to 1 lb. of blasting powder, and the explosion partly tore the walls from the framework, but the sheets showed no sign of shattering or tearing although surface cracks and bulging were evident.

Hydro-Electric Power Scheme in Iceland

A new hydro-electric station is now in operation in Iceland. It has been built in connection with a scheme for harnessing the River Sag, which has four falls, estimated to be capable of producing a total of 100,000 h.p. The new station comprises two 6,250 h.p. units.

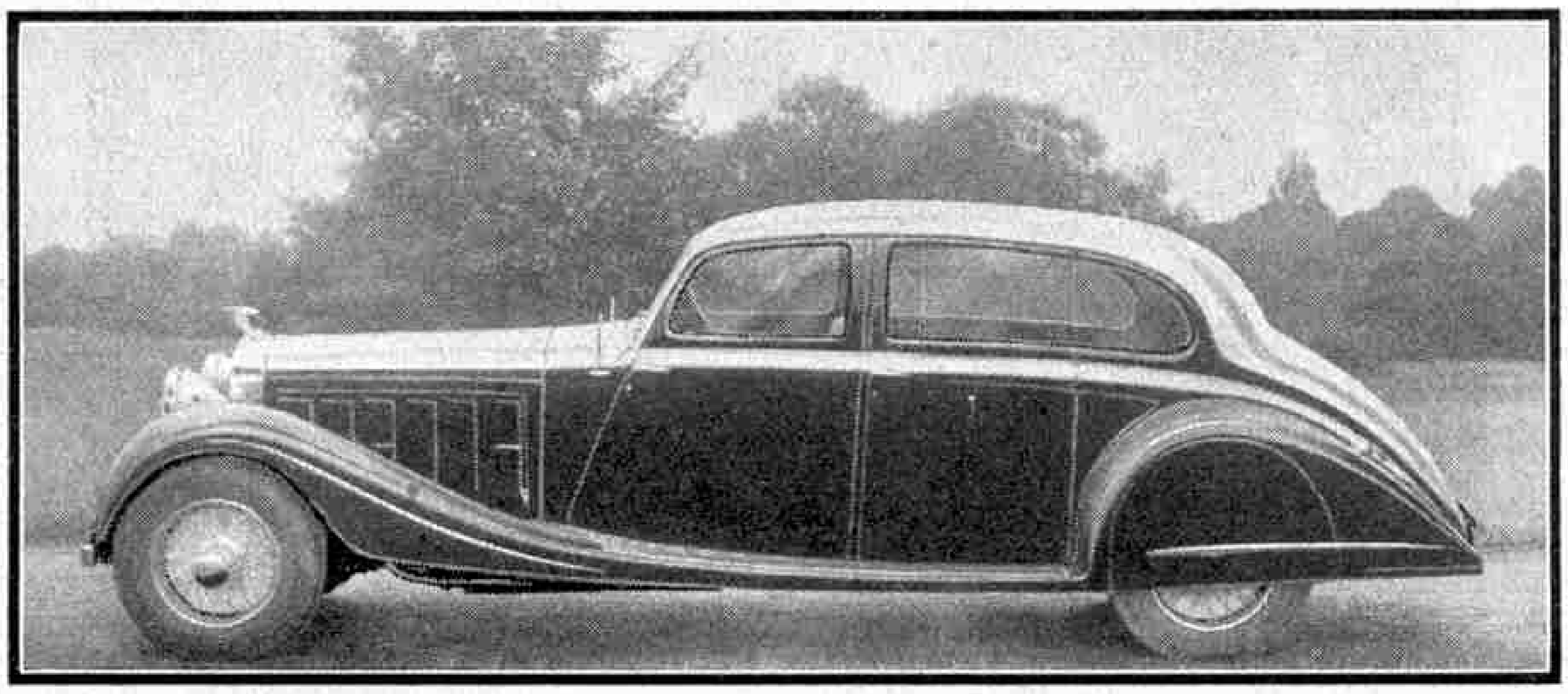
A Waterless Welded Gasholder

A new waterless gasholder of welded construction is now being constructed at the Ford Motor Company's works at Dagenham by Horseley Bridge and Thomas Piggot Ltd. It is 126 ft. in diameter and over 185 ft. in height, and is the first gasholder of the kind to be erected in this country. It will have a gas capacity of two million cu. ft.

A Magnificent Motor Car

A splendid State limousine, fitted with an unusually large body, is shown in the lower illustration on this page. The chassis is a 12-cylinder Hispano-Suiza, and the overall length of the body is 19 ft. 6 in. The car was supplied by J. Gurney Nutting and Co. Ltd., London, to the order of H.H. the Maharajah of Indore.

The exterior colour scheme is black and silver, with chromium-plated mouldings, and the rear compartment is finished in red cloth and the front compartment in black leather. Among the many luxurious fittings are folding tables containing writing materials, and special red and blue identification lights, which are built into the top of the windscreen. There are also automatic lights to illuminate the running boards when the doors are opened, and an electrically operated blind is fitted to the rear of the compartment.



A Hispano-Suiza limousine supplied to the Maharajah of Indore. Its fittings include coloured identification lights on the windscreen. Photograph by courtesy of J. Gurney Nutting and Co. Ltd., London.

Remaking the Tennessee Valley

A Great American Engineering Project

THE Tennessee Valley in the United States is the scene of one of the greatest reconstructional projects ever undertaken. Its object is to bring fresh life and prosperity to a region over 40,600 square miles in extent, or roughly four-fifths the area of England, with a population of two and a half million people. The estimated total cost of nearly £75,000,000 gives some idea of the extent of this vast enterprise. It is being carried out by a special body known as the Tennessee Valley Authority, usually referred to by its initials T.V.A., which was set up in 1933.

The Tennessee River is a tributary of the Ohio, which flows into the Mississippi more than 1,000 miles from its mouth. Yet the Tennessee has a length of over 700 miles, and is the fifth largest stream in the United States. The whole of the region receives a heavy rainfall and was once covered with forests. The early white settlers in the country cut down the trees and ploughed up the land for cultivation, however. As the soil was fertile the farmers prospered for a time, but their methods were very wasteful. Successive crops exhausted the ground, and as this was robbed of its protective covering of trees and vegetation it was unable to resist the erosive forces of wind and rain, which carried away the rich surface soil. In consequence vast stretches became little better than desert. Many farmers left the country, and those who remained found it increasingly difficult to obtain a livelihood.

The first task of the Authority is to stop this disastrous land erosion. Farmers have been encouraged to sow grass on the hillsides and to plant trees on the slopes rather than plough them for corn. The hillside gullies are being filled up, check-dams built and terrace cultivation introduced. Fertilisers are being supplied free of charge for use in the area. These are the product of the T.V.A. itself, manufactured from the local phosphate rocks. Attempts also are being made to raise the standard of life in the Valley by the introduction of new industries, and by the development of its mineral resources.

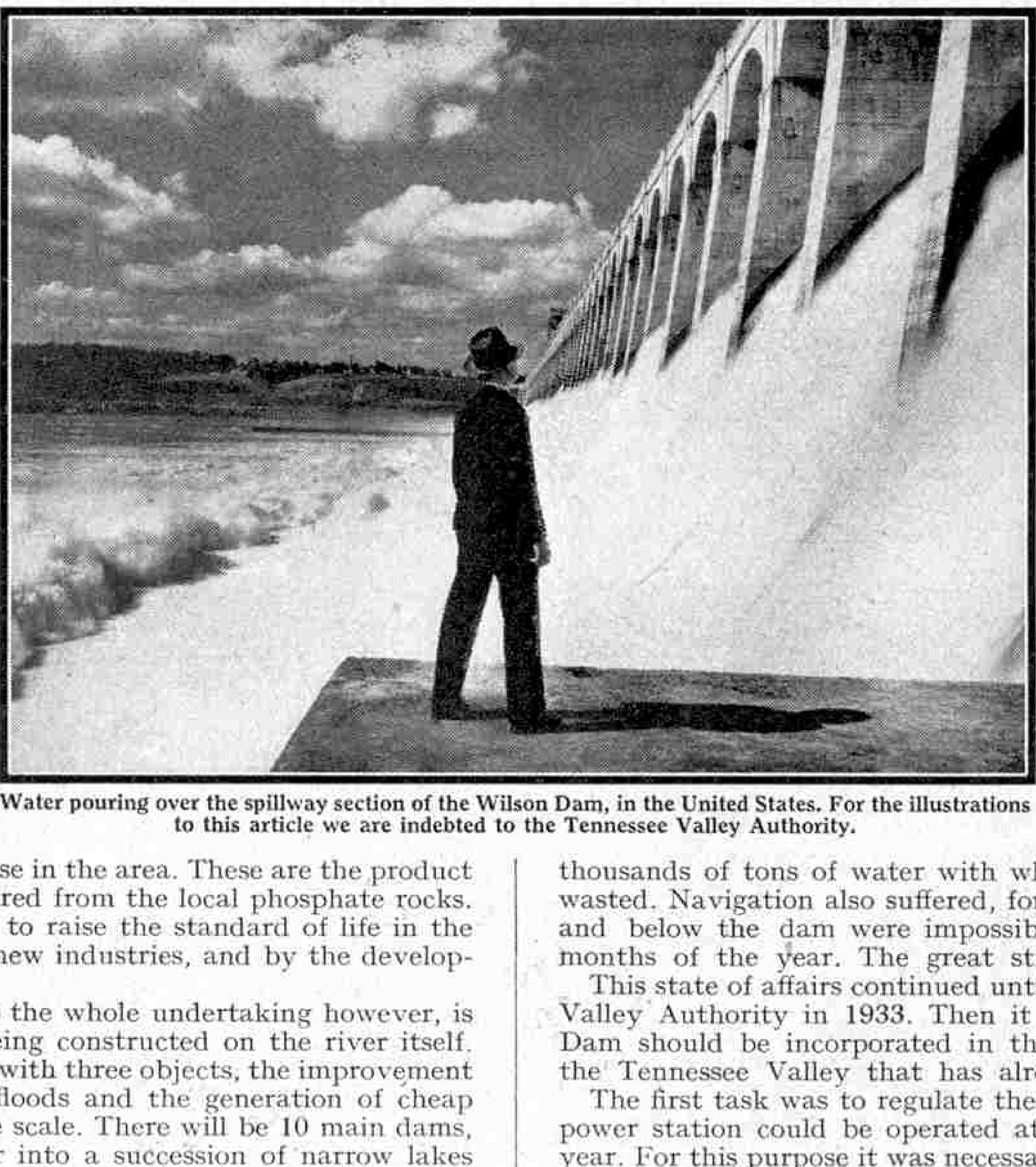
The most striking feature of the whole undertaking however, is the series of dams that are being constructed on the river itself. These dams have been planned with three objects, the improvement of navigation, the control of floods and the generation of cheap hydro-electric power on a large scale. There will be 10 main dams, which will transform the river into a succession of narrow lakes stretching from Knoxville, on its upper reaches, to its junction with the Ohio, 650 miles downstream. These lakes will be at successively lower levels, and navigation locks therefore will form part of each dam. Other dams on the main tributaries of the Tennessee will store up water behind them, and this will be used to equalise the flow of the river, making navigation possible throughout the year and allowing the generating plants to work continuously at full capacity even in summer, when the river's flow is lowest.

Of the main river dams, three had already been constructed when the Tennessee Valley Authority was constituted in 1933. The greatest of these was the Wilson Dam at Muscle Shoals, a stretch of the river where there is a vertical fall of 135 ft. in a distance of 37 miles. There the current rushes along at a speed of 10 m.p.h., and only a birch bark canoe could be navigated through these rapids. This dam now has behind it a deep navigable pool extending for many miles upstream and the historic Muscle Shoals rapids no longer exist.

The dam was built during and immediately after the Great War, and at that time was the largest in the world. It formed part of a scheme for making nitrates for explosives from the nitrogen and oxygen of the air by means of the electric arc, a giant hydro-electric power station built below it supplying the necessary current.

The Wilson Dam has a length of 4,860 ft. It rises 137 ft. above the bed of the river and is 105 ft. thick at the base, the enormous total of 1,240,500 cu. yds. of concrete being used in its construction. The water that is not needed for the generation of power flows over the spillway section, 2,900 ft. long, which is controlled by 58 great steel gates, each 38 ft. wide and 18 ft. high. These massive gates weigh 33 tons each. If necessary they can pass 960,000 cu. ft. of water per sec., a quantity far greater than the highest recorded flow of the river.

At the north end of the dam are two locks for river traffic, each with a lift of 45 ft. giving a total lift of 90 ft. They are 60 ft. wide and 300 ft. long and were hewn out of the solid limestone rock that underlies the area. The power station stands at the southern end of the dam. Its nine turbines have a total capacity of 261,400 h.p., but provision is made for the installation of 10 more, each of 35,000 h.p. Water is conveyed to the turbines through 54 great steel penstocks, each 12 ft. wide and 16 ft. high, and these can deal with a flow of 62,000 cu. ft. of water per second.



Water pouring over the spillway section of the Wilson Dam, in the United States. For the illustrations to this article we are indebted to the Tennessee Valley Authority.

The dam was not finished when the Great War came to an end. Work continued for a short time and then was stopped and was not restarted until 1922, the dam being completed in October 1926. Even then the electric power produced was used only for operating the locks, and for maintenance work on the dam, the surplus being sold to a power company. During part of the year, the flow of water was insufficient to operate the turbines; at other seasons thousands of tons of water with which they could not deal were wasted. Navigation also suffered, for parts of the river both above and below the dam were impossible for shipping during several months of the year. The great structure had only local value.

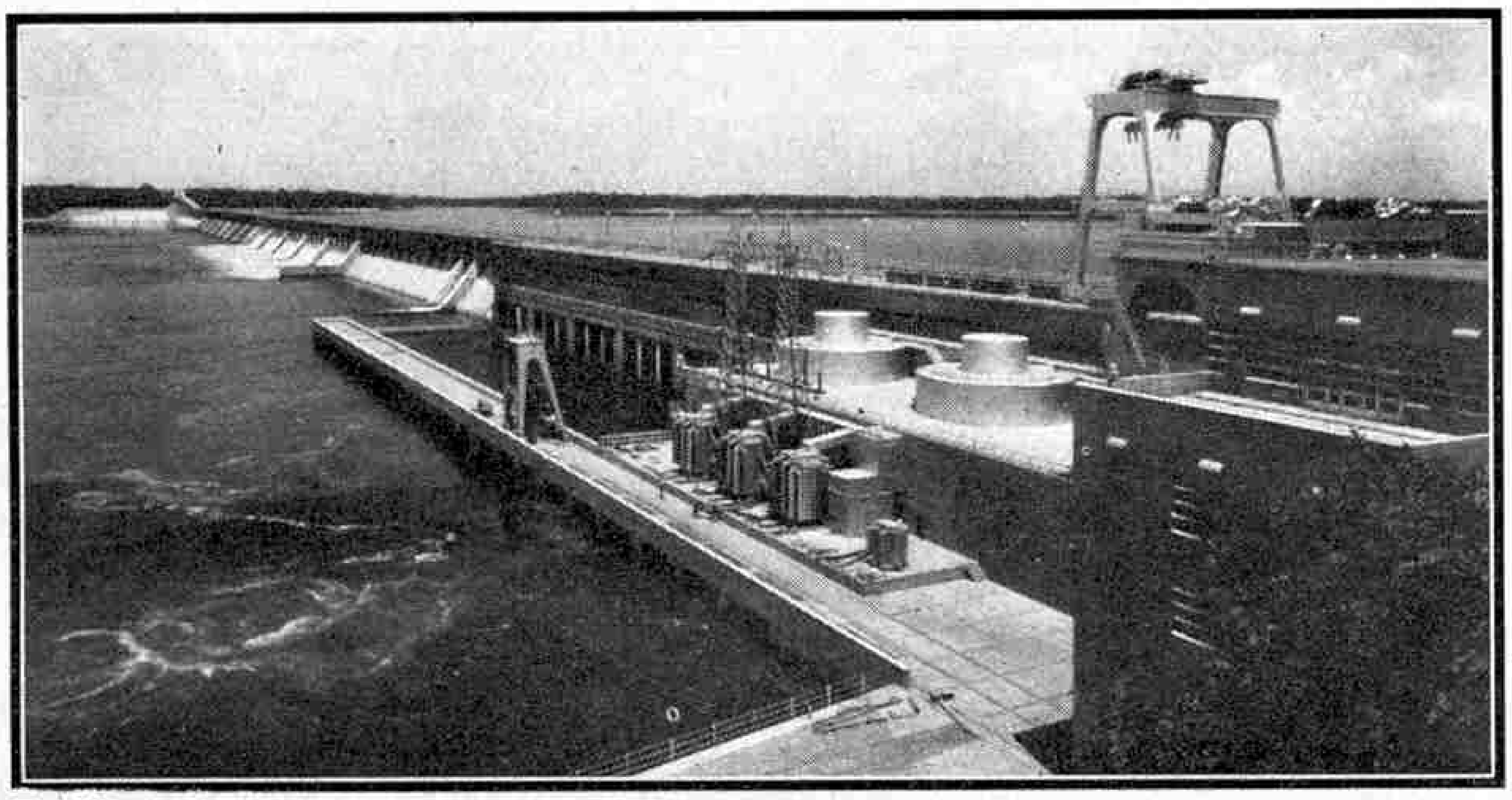
This state of affairs continued until the creation of the Tennessee Valley Authority in 1933. Then it was decided that the Wilson Dam should be incorporated in the vast scheme for developing the Tennessee Valley that has already been outlined.

The first task was to regulate the river so that the Wilson Dam power station could be operated at full capacity throughout the year. For this purpose it was necessary to control the upper waters, storing these in the rainy season, and releasing the conserved water as required when the natural flow was insufficient. The Clinch River, an important tributary of the Tennessee, was chosen for the work, and the Norris Dam has been built across it at a point 470 miles above the Wilson Dam.

This dam is an enormous concrete structure, 1,860 ft. long and 265 ft. high, with a base thickness in the spillway section of 204 ft. Its most remarkable feature, however, is the extent of the enormous reservoir formed behind it by the accumulating water. This reservoir has an area of 83 sq. miles, and its irregular shape gives it a shore line of about 800 miles. While the dam itself was being built men were at work clearing the land above it that was to be flooded. To many of those living in the area this meant tragedy. Some of them were slow to realise the advantages that would come to them from the scheme, and showed so much reluctance to leave their homes that great tact was necessary in dealing with them.

The spillway in the centre of the dam is divided into three sections, each 100 ft. long and fitted with drum gates. Although the chief purpose of the Norris Dam is the storage of water, it also is being used for the development of hydro-electric power, and the plant built there has two turbines with a total capacity of 132,000 h.p.

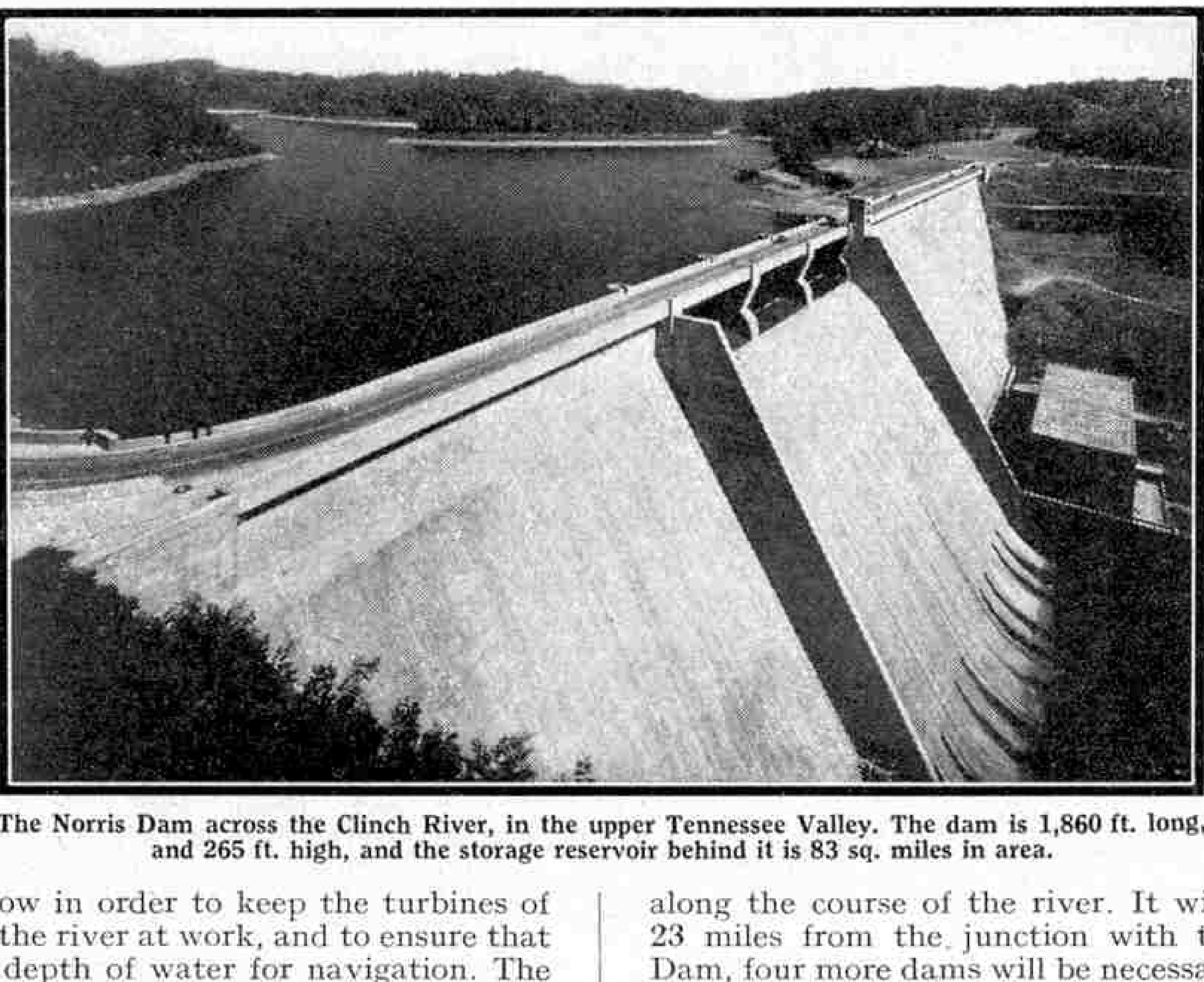
The Norris Dam was built in two stages. One half of the site was first enclosed in a cofferdam, and after the water had been pumped out the foundations of this section were laid, and the structure brought up to a level a little above that of the river bed. The cofferdam was then removed and a second one erected to enclose the rest of the site. While work was in progress on this section, the river flowed over the concrete already placed. When the second half of the foundation had reached the level of the first, the cofferdam was removed and the river passed through 50 ft. openings left for the purpose while the dam was completed.



The Wheeler Dam, which has a length of 6,502 ft. and is one of the largest concrete structures of this kind in the world. It regulates the flow of the Tennessee River above the Wilson Dam.

The concrete of the dam was laid by means of two 1,925 ft. cableways that spanned the site and were carried on tall steel towers. It was delivered in buckets that held 6 cu. yds. and was poured in blocks 5 ft. deep and 56 ft. long. In each block sensitive electrical instruments were embedded to measure the slightest change of temperature in the concrete, and to record the strains to which the structure was subjected.

Work was carried out at a remarkable speed. The dam was begun in the spring of 1934, and by March 1936 was so far advanced that the sluice gates were closed and the water began to pile up behind it. The value of the great barrier in flood control was strikingly demonstrated early in the following year. By storing the heavy seasonal rains it reduced the flow of the Tennessee by 4 ft. and saved thousands of acres from being flooded. It is estimated that £200,000 worth of damage was thus avoided.



The Norris Dam across the Clinch River, in the upper Tennessee Valley. The dam is 1,860 ft. long, and 265 ft. high, and the storage reservoir behind it is 83 sq. miles in area.

The second great enterprise undertaken by the Authority was the building of the Wheeler Dam on the Tennessee River. This has been constructed at the head of the lake 15 miles in length, that stretches back from the Wilson Dam. It was completed towards the end of 1936, and behind it there is now another level waterway extending about 74 miles up river to Guntersville, where yet another dam is rising.

The main purpose of the Wheeler Dam differs from that of the Norris Dam. The latter is intended to store up water for regulating the flow of the river. It is capable of holding up a year's rainfall from several thousand square miles of land and this will be released during periods of low flow in order to keep the turbines of the power stations lower down the river at work, and to ensure that there will then be a sufficient depth of water for navigation. The Wheeler Dam is an aid to navigation and flood control, but it also helps to equalise the flow of water between the Norris and Wilson Dams. Both of course are used for the development of hydro-electric power.

The Wheeler Dam is only 72 ft. high, but its overall length of 6,502 ft. makes it one of the longest concrete dams in the world. The spillway section of 2,700 ft. has 60 huge steel gates, 40 ft. wide by 15 ft. high, which give it a capacity of 687,000 cu. ft. of water per second. At the north end of the dam is a single lock 360 ft. long and 60 ft. wide. This has a maximum lift of 53 ft., which was the greatest of any single lock in the United States until the completion of a lock at Pickwick Landing, 53 miles below Wilson Dam. The power house is situated at the extreme southern end of the dam. Two turbines at present installed each generate 48,000 h.p. and it is intended to install six others of similar power.

An unusual feature of the constructional work was the use of floating concrete mixing equipment. For this purpose four welded steel barges were built, each 90 ft. long and having a draught when fully loaded of 5½ ft. The river itself actually contributed to the dam that helped to tame it, for the sand and gravel used in making the concrete were dredged from its bed. The cement was brought to the river bank by rail, and delivered in barges to the mixers, which were stationed just outside the cofferdams so that the concrete could be easily transferred in dumping buckets hoisted by swivel cranes to the required points.

Up to the present the Norris and Wheeler Dams are the only ones that have been completed in connection with the scheme. Work is in progress on others, however, the most advanced being that at Pickwick Landing, already referred to. This will have a total length of 7,715 ft., made up of earth-filled sections across the valley on each side of the river, and a concrete structure 2,056 ft. long spanning the main channel, and the reservoir above it will stretch upstream to the Wilson Dam. The first stage in building the Pickwick Landing Dam was the construction of a lock to enable river traffic to pass. This lock has a lift of 61 ft., or 8 ft. more than that of the Wheeler Dam Lock, and thus has the greatest single lift of any lock of its kind. It has an area of 1½ acres.

The second stage in the construction of the dam included the erection of the power house, the non-overflow section and the spillway, the central portion of which will be built last. Generating equipment will not be installed in the power house immediately, but if the demand for the Authority's supplies of electricity is sufficient, six 34,000-kW. turbines will eventually be operated there.

The remaining dams to be constructed will serve principally to improve navigation on the Tennessee River. The aim of the Authority is to provide a 9-ft. channel in the river between Knoxville and the junction with the Ohio. The lowest of the dams will hold back water to form a lake 184 miles in length that will be the largest along the course of the river. It will be situated at Gilbertsville, 23 miles from the junction with the Ohio. Above the Wheeler Dam, four more dams will be necessary to complete the Authority's plans. Of these two are now under construction; the others are authorised, but work upon them has not yet commenced.

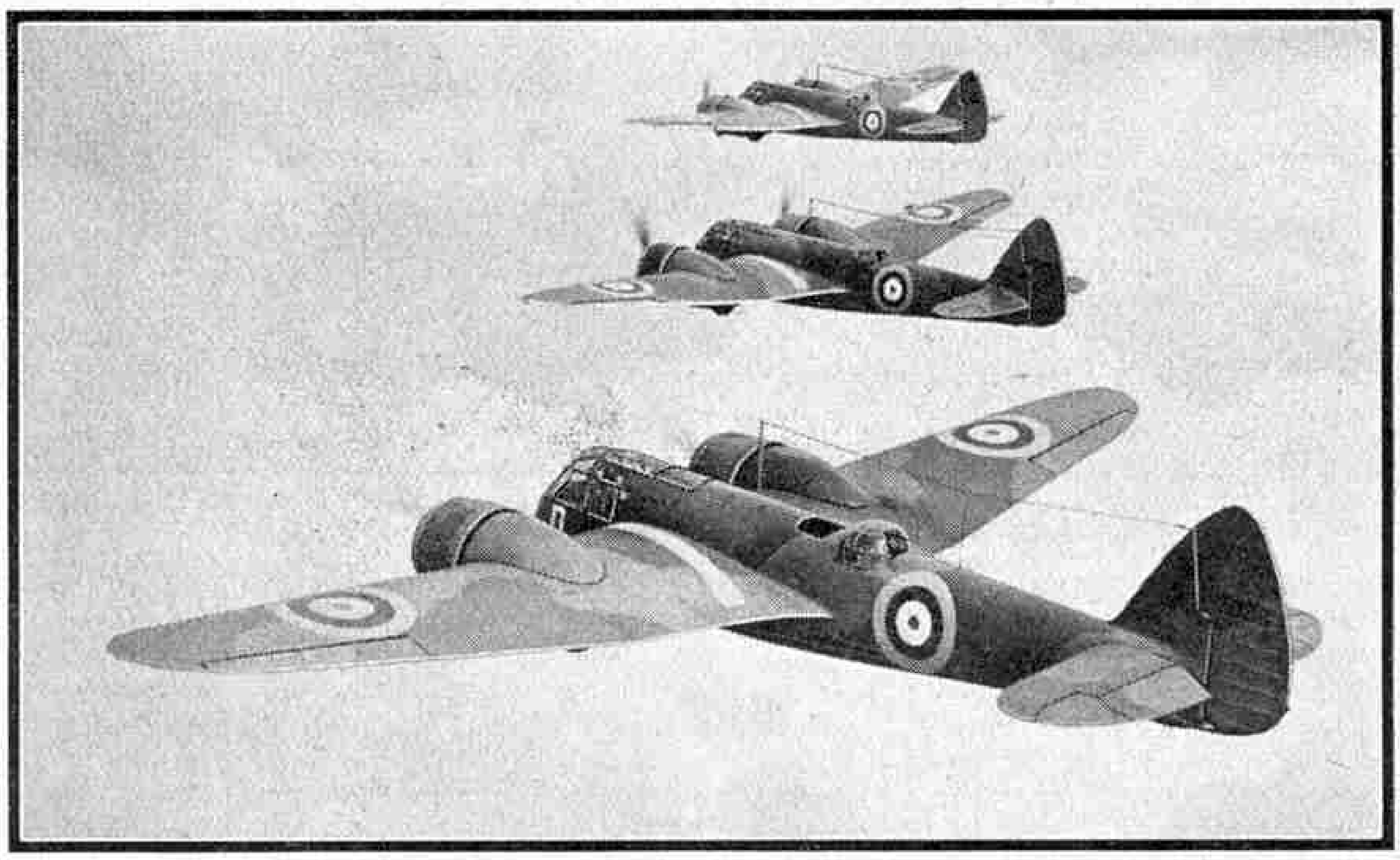
According to the plans of Tennessee Valley Authority this vast scheme will not be completed until 1943, when the last of the dams they have planned will be finished, and the Wilson and other dams already in existence will have been raised to a greater height in order to bring them into line with the full aims of the programme for making the best possible use of the river.

For the information contained in this article we are indebted to the Tennessee Valley Authority.

Bristol "Blenheim" Bombers for the R.A.F.

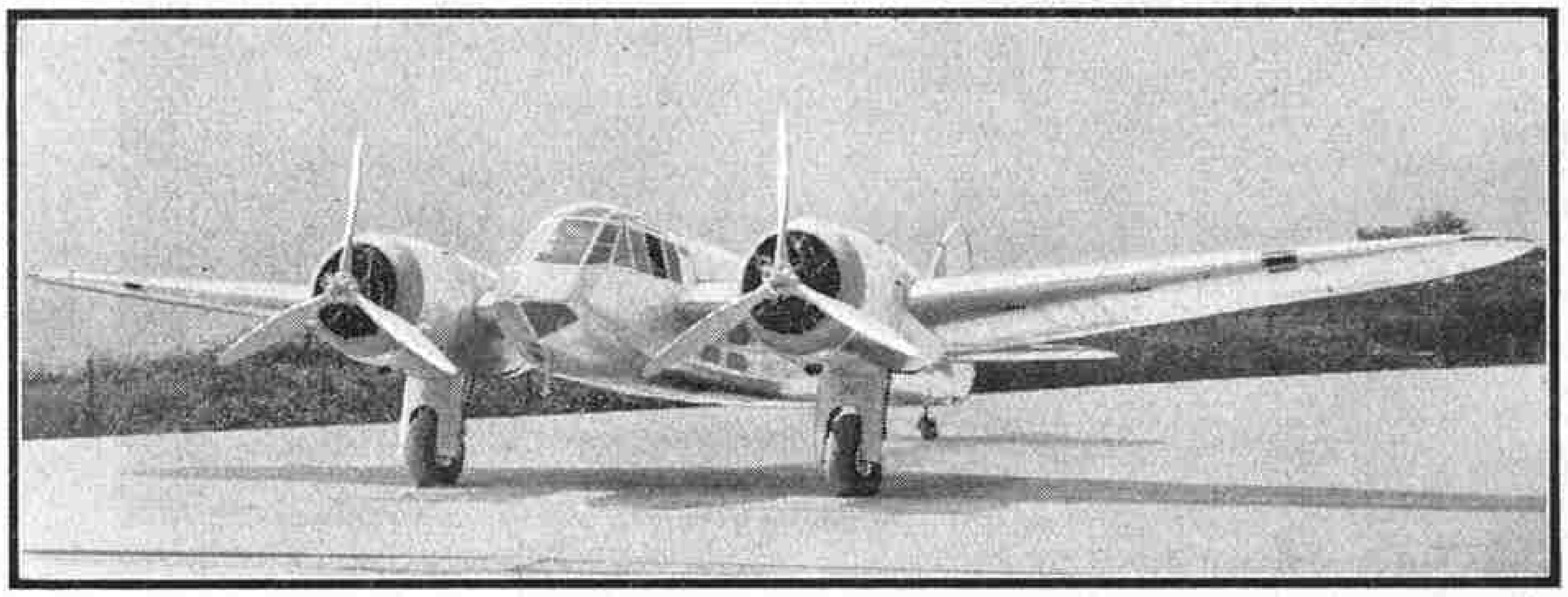
Fastest of their Class in the World

SEVERAL squadrons of the Royal Air Force are already equipped with the Bristol "Blenheim" high speed medium bomber, undoubtedly the most advanced and revolutionary type of aircraft used in quantity by the R.A.F. A brief description of it was given in the March 1937 "*M.M.*," and readers will recall that it has been developed from "*Britain First*," the fastest civil aeroplane in the world, which was designed and built by the Bristol Aeroplane Company about two years ago. The "Blenheim" is a comparatively large twin-engined bomber, and its remarkable performance has astonished R.A.F. pilots. It is not only the fastest bomber of its class in the world, but is very much speedier than the fastest single-seater fighters in the Service. The full possibilities of the many uses of this new bomber are only just beginning to be appreciated, and it will be some time before the necessary attitude that must be adopted toward aerial tactics and strategy can be adjusted to the new conditions.



Bristol "Blenheims" of No. 114 (Bomber) Squadron, R.A.F., flying in formation. These aircraft have a nominal speed of 280 m.p.h. Photograph reproduced by courtesy of "Flight."

One of the most striking features of the air exercises over Great Britain last autumn was that the raiding "Blenheims" outwitted the defending fighters every time by their speed, manœuvrability and climb; the smaller, intercepting machines simply could not get near them. One of the official observers at these air manœuvres reported that the "Blenheim" squadron found it unnecessary to take off until half an hour after the other aircraft had left! It is indeed the sight of the take-off and climb of the "Blenheim" that is so sensational. Air-borne in 300 yds. in only 15 sec.; reaching 5,000 ft. in less than 3 min., at the rate of nearly 2,000 ft. per min.; and 10,000 ft. in 5½ min., the rate of climb is still over 1,000 ft. per min. at 15,000 ft. and a height of 20,000 ft. is reached in only 13 min. The bomber has a nominal speed of 280 m.p.h. when fully loaded and flying level, and it has aptly been remarked that even when carrying a full load it is as manœuvrable as a high performance fighter.



This view shows the "Blenheim" to be a monoplane of the middle wing type, a wing arrangement that is becoming increasingly popular for military aircraft. Photograph reproduced by courtesy of the Bristol Aeroplane Co. Ltd.

The "Blenheim" is an aeroplane with a span of over 56 ft. and a loaded weight of more than 12,000 lbs., yet it will cruise along with "hands off," and is instantly responsive to either rudder or ailerons for any change of direction. It is fitted with servo strips and trimming tabs for the elevators and rudder, and with split trailing edge flaps in four sections right across the wings; and is remarkable for its inherent stability and lightness of control. The wheels of the retractable undercarriage are fitted with pneumatic brakes which can be operated simultaneously by a hand lever in the control column, or by differential control through the normal movement of the rudder pedals. These brakes and the hydraulically-operated trailing-edge wing flaps enable the aeroplane to land at a comparatively slow speed and with an unusually short run for this class of aircraft. In fact, the pilot can bring it to rest in 400 yds., a distance short enough to ensure a safe landing at any ordinary aerodrome.

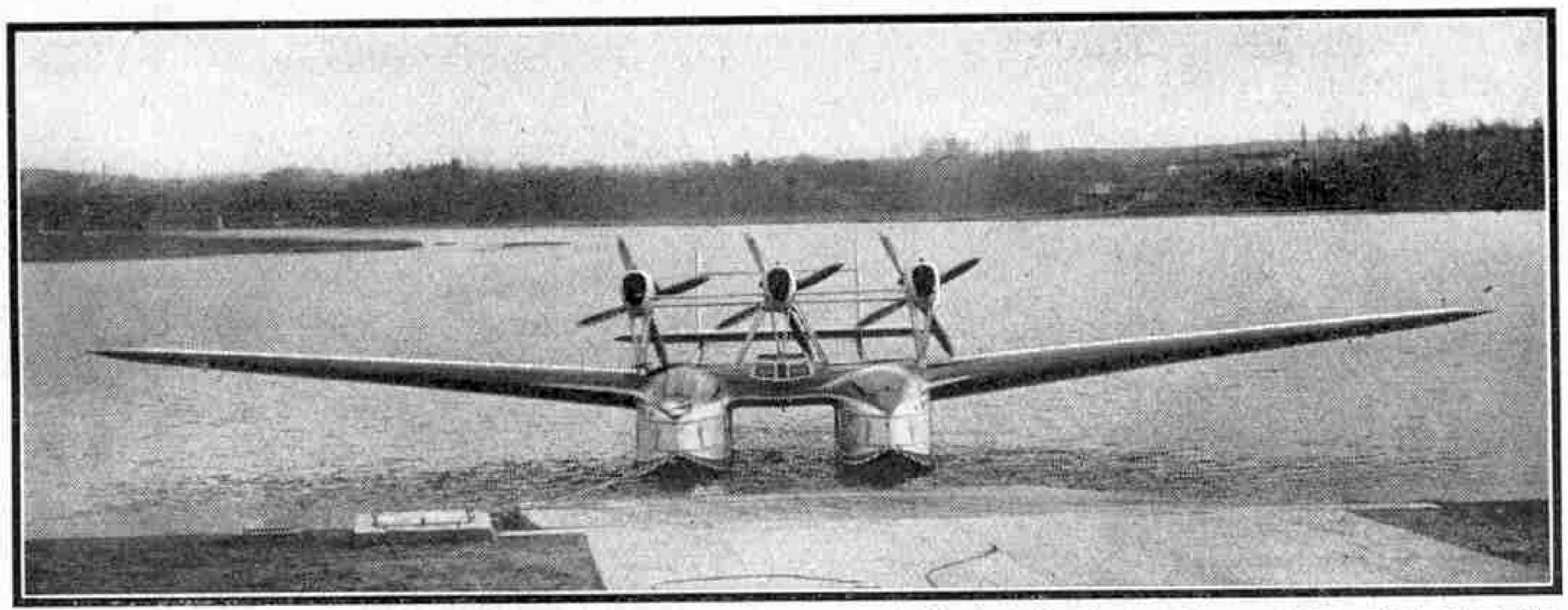
The outstanding performance of the "Blenheim" is largely due to the two Bristol "Mercury" engines with which it is equipped. These are nine-cylinder, radial, air-cooled units, which develop their maximum power of 840 b.h.p. at 2,750 r.p.m. at a height of 14,000 ft. They are fitted with close controllable cowlings and de Havilland-Hamilton controllable pitch airscrews.

The "Blenheim" is a middle wing cantilever monoplane, built entirely by a method of stressed skin construction that has been developed by the Bristol Company and gives a high structural strength for a low load. The enclosed cockpit has a transparent forward-sliding roof, that can be used as a means of entry or exit for the crew. The "Blenheim" carries a pilot, a bomb-aimer-navigator, and a wireless operator who also acts as rear gunner.

Savoia-Marchetti Air Liners

Italian Company's Notable Designs

THE Savoia-Marchetti Company, an Italian firm founded in 1915, has produced many excellent types of commercial and military aircraft. For a long time the company specialised in the construction of flying boats, some of which have performances of outstanding merit to their credit. In 1930 a formation of 12 Savoia-Marchetti S-55 military flying boats led by General Balbo flew from Rome across the South Atlantic to Rio de Janeiro. An even greater achievement was the formation flight in 1933 of 24 Savoia-Marchetti S-55X flying boats, also under the leadership of General Balbo, from Rome to Chicago and back, a total distance of 11,500 miles. The outward flight was by way of Iceland and Labrador, and the return trip via New York, Newfoundland, the Azores, and Lisbon.



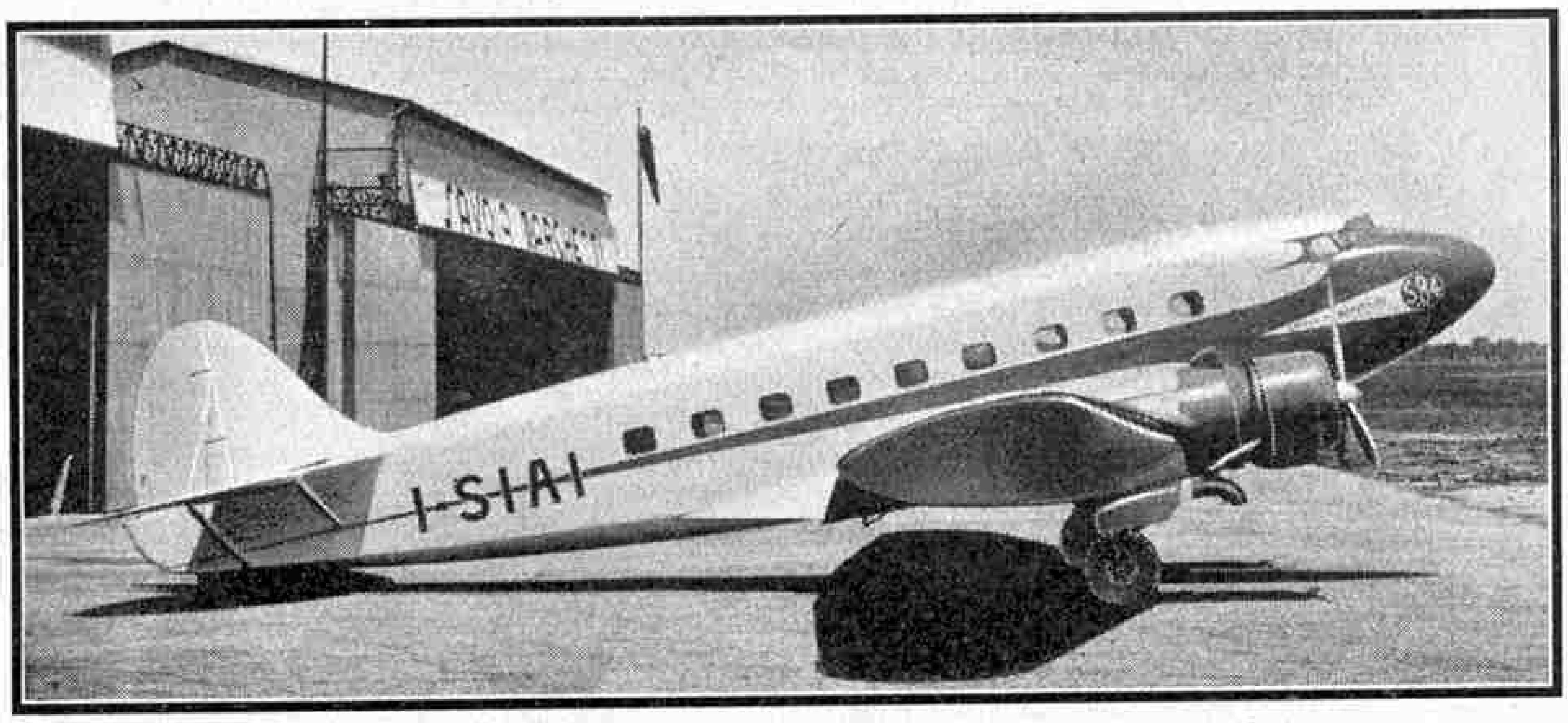
This view of the Savoia-Marchetti S-66 flying boat shows the unusual positions of the three engines and the pilots' cabin. The illustrations to this article are reproduced by courtesy of Societa Idrovolanti Alta Italia "Savoia-Marchetti," Italy.

Savoia-Marchetti S-66 commercial flying boats have been doing good work on the Levant air services of Ala Littoria, the chief Italian air transport company, and the upper illustration on this page shows an aircraft of this type. Like the military S-55 and S-55X referred to above, the S-66 has two parallel wooden hulls. The front portion of each contains a very comfortable cabin for nine passengers, who enter through a watertight door on the inner side, and near the bow, of the hull. The rear part contains a sleeping cabin for four persons, the berths being arranged two on each side of a central gangway. The cabins are airy and well lighted, and have windows that can be opened. There is a luggage compartment in the stern of each hull.

An interesting feature of this flying boat is the unusual position of the pilots' compartment, which occupies the middle of the wing centre section. This elevated position ensures a good outlook over the hulls. Immediately behind is a small compartment for the engineer, and a tunnel inside the wing provides communication with both hulls. The wing is built in three parts. The two outer sections project from the hulls, and these are attached to the ends of the centre one, which also carries the tubular steel struts supporting the engine nacelles. Long parallel booms project from the trailing edge of the wing and support the tail unit.

The flying boat is equipped with three Fiat A.24R water-cooled type engines, the normal output of which is 700 h.p. and these enable the aircraft to attain a top speed of 164 m.p.h. With only two engines running a maximum speed of 138.8 m.p.h. can be reached. The engine nacelles are above the wing centre section, as shown in our illustration, and are connected by horizontal tubular steel struts. The fuel tanks are fitted in the outer sections of the wing.

The wing span of the S-66 is 108 ft. 3 in., its length 54 ft. 6 in., and its height 16 ft.



The Savoia-Marchetti S-84, a twin-engined monoplane air liner with seating for 18 passengers.

The Savoia-Marchetti S-84 low wing monoplane shown in the lower illustration on this page is a more recent type. It is a typical modern air liner, with a long slender fuselage and retractable undercarriage. The passenger cabin has 18 seats, nine on each side of a central gangway, and each chair is alongside a window. The pilots' cabin is in the nose of the fuselage, and just behind it is a compartment for the radio operator and engineer. There are two luggage compartments, one beneath the floor of the pilots' cabin and the other under the passenger cabin. The wing is of 78 ft. 8½ in. span and is made in three sections, the centre one being secured to the underside of the fuselage.

The S-84 is fitted with two Gnôme-Rhône 14Krsd engines, and has a top speed of 220.4 m.p.h. at 13,120 ft.

Southward Ho! in France

A Great Run with *"La Flèche d'Or"*

By a Railway Engineer

THE performance of locomotives is nowadays so closely observed by both technical engineers and enthusiastic amateurs that the maximum capabilities in service of any particular type are fairly well known. Occasionally however there comes a run quite unprecedented in speed or haulage power; a run that upsets all one's ideas as to what a particular type can do. I was supremely fortunate enough to experience such a journey, when travelling on the Northern Railway of France on the footplate of the southbound *"Flèche d'Or"* or *"Golden Arrow."* I have always had a very high opinion of the "Super-Pacifics" but I must say I was scarcely prepared for the amazing exhibition put up by No. 3-1252 when I travelled from Calais to Paris.

I came down the gangway of the steamer to receive a cordial welcome from Locomotive Inspector Baudry, who accompanied me on the footplate on the journey described on page 582 of the November 1937 *"M.M.,"* and was to travel with me on this trip also; he introduced me to Driver Blondel and Fireman Mantez, a Calais crew, who were in charge of No. 3-1252. The load was a heavy one, five Pullmans, three sleepers for the Mediterranean, and two heavy baggage vans; this made up a tare load of 502 metric tons—about 493 English tons—and the gross weight behind the tender was about 515 English tons. With such a load it would in any case mean good going to cover the 184.1 miles from Calais to Paris in 190 minutes; but owing to the late arrival of the boat it was not until 3-6 p.m., 36 min. behind time, that we got the *"Right Away."*

The southbound "Flèche d'Or" near Caffiers summit hauled by "Super-Pacific" No. 3-1252. This illustration and the lower one on the opposite page are by courtesy of the Northern Railway of France.

For the first 1¼ miles the line winds about in most bewildering fashion, alongside the harbour and its quays, and through Calais Ville station, and then swings round through considerably more than a right-angle to Les Fontinettes, just beyond which station the line to Brussels diverges. Until quite recently speed had to be kept very low round these curves, but now the track has been re-canted to a remarkable degree of super-elevation, and we got away with amazing rapidity. Blondel started No. 3-1252 on simple working, with 75 per cent. cut-off in the high-pressure cylinders and 68 per cent. in the low-pressure. The high-pressure cut-off was gradually reduced to 40 per cent. by the time we passed Les Fontinettes, and the regulator was now pushed farther over, raising the pressure in the steam chests to 70 lb. per sq. in.

The line is level for the first 3¾ miles out of Calais, and then comes the formidable ascent to Caffiers, 7¾ miles at 1 in 125, over the high hills inland from Cap Gris-Nez. This bank provides a most exacting test, coming right at the start of the journey before the engine has had much time to warm up. Still continuing on simple working, and accelerating like lightning from Les Fontinettes, we fairly charged the bank. We were doing 65 m.p.h. when we struck the 1 in 125 grade, only 3¾ miles from the Calais start, and then Blondel immediately opened out to 50 per cent. cut-off in the high-pressure cylinders. The response of the engine was brilliant beyond measure.

The bulk of the ascent is on very sharp curves where the line swings westward through Pihen in a wide horseshoe to ease the grading. But for this detour the incline would be much steeper. Nearing the summit in a high wind and pouring rain we were going magnificently at 46 m.p.h., when most unfortunately the engine slipped, and speed fell to 44 m.p.h. through Caffiers station. The 11½ miles from Calais to this point had been covered in the wonderful time of 16¼ min.

Once past Caffiers the pace became really "hot." With a mere wisp of steam passing through only the high-pressure cylinders, we swept down to Marquise at the legal maximum speed, 75 m.p.h. A moderate opening-out took us up the sharp rise beyond, 1¾ miles at 1 in 125, without going below 62½ m.p.h., and soon we were racing again, at 75 m.p.h., with the coast ahead, and a fascinating sight of the storm-tossed sea through the cab glasses. The popular resort of Wimereux was gone in a flash, and now we were easing up for a careful passage through the outskirts of Boulogne. With lights on in the cab we went through the tunnels at 48 m.p.h., past Boulogne Tintilleries station, and then in the open once more we got away in tremendous style.

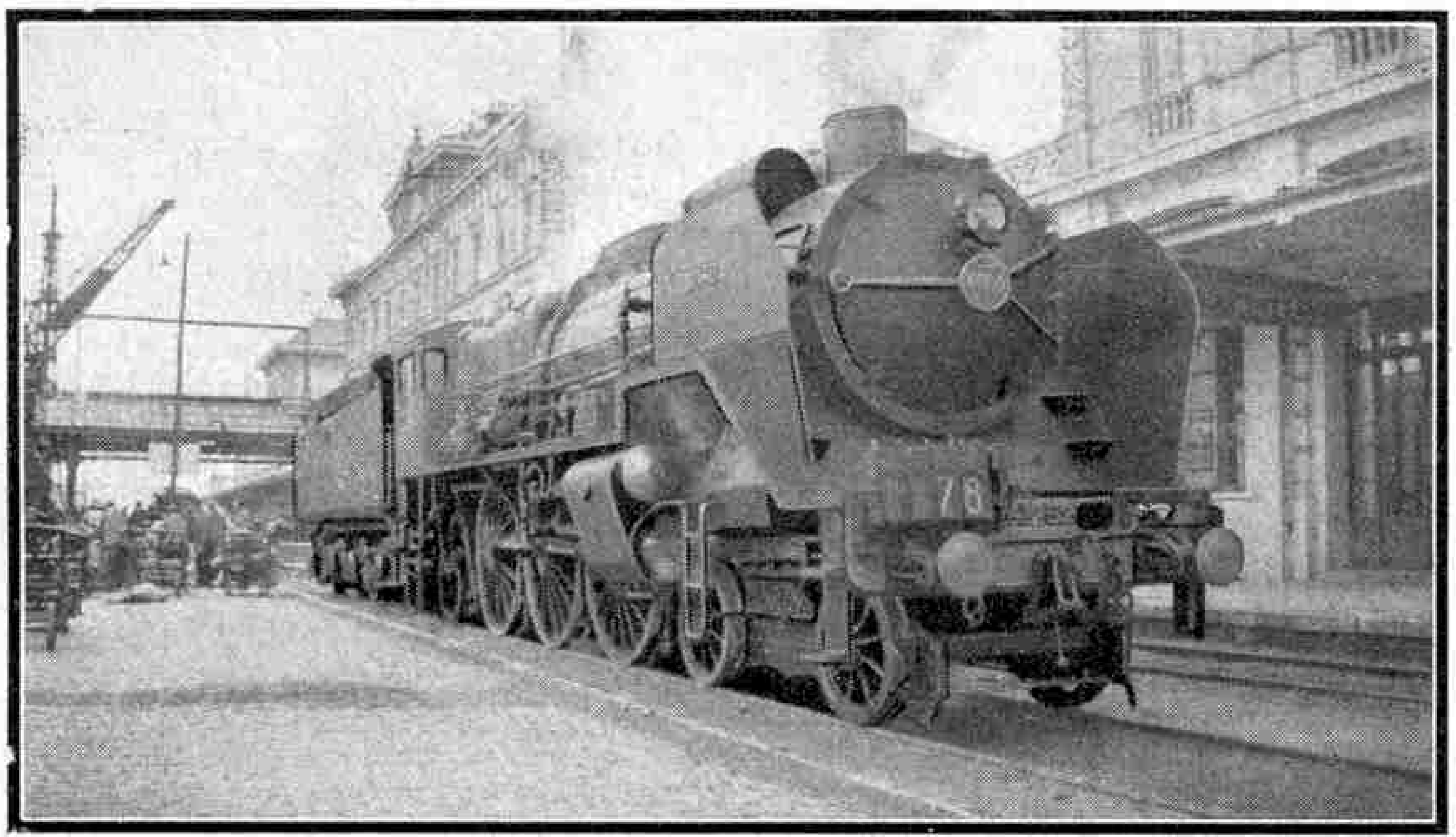
We had passed Tintilleries, 26.3 miles from Calais, in 29¼ min., and now No. 3-1252 was working full compound, with 40 per cent. cut-off in the high-pressure cylinders and 65 per cent. in the low. The regulator was just over half open, giving steam chest pressures of 185 lb. per sq. in., high-pressure, and 25 lb. per sq. in. low-pressure. The acceleration from the Boulogne slack naturally was not so fast as in that phenomenal start out of Calais, where the engine was working simple, but at Pont de Briques, 3.4 miles beyond Tintilleries, we were doing 65½ m.p.h. Still rapidly accelerating, on the dead level, No. 3-1252 attained 71 m.p.h. at Hesdigneul before striking the stiff rise to Neufchatel. No adjustment of either cut-off or regulator was needed here, and the 4 miles at 1 in 133-143 were taken at the splendid minimum speed of 52 m.p.h.

Now the regulator was brought back for the equally steep descent to Dannes-Camiers, and with only the high-pressure cylinders in action we bowled downhill at 73 m.p.h. It would be no use to put on a big spurt here, for now the town of Etaples was prominent in the wideflung panorama of coast and sea that lay ahead of us, and round the sharp curve through that station there is a speed restriction to 62 m.p.h.

Clearing this station, 43½ miles from Calais in 45¾ min., Blondel now advanced the high-pressure cut-off to 42 per cent., a positively minute adjustment that on a simple engine would be less than 1 per cent., and moved the regulator handle to just beyond the half-way mark, giving full compound working. No. 3-1252 had soon recovered from 62 m.p.h. to 70 m.p.h., and with high-pressure cut-off reduced to 40 per cent. once more we bowled along through Quend Fort Mahon and Rue at a steady 72–73 m.p.h. From Étaples almost to Amiens, a distance of nearly 60 miles, the line is practically dead level, and along here the performance of the engine was most impressive—under quite easy steam, too—for one can hardly consider 40 per cent. high-pressure cut-off strenuous working on a compound engine.

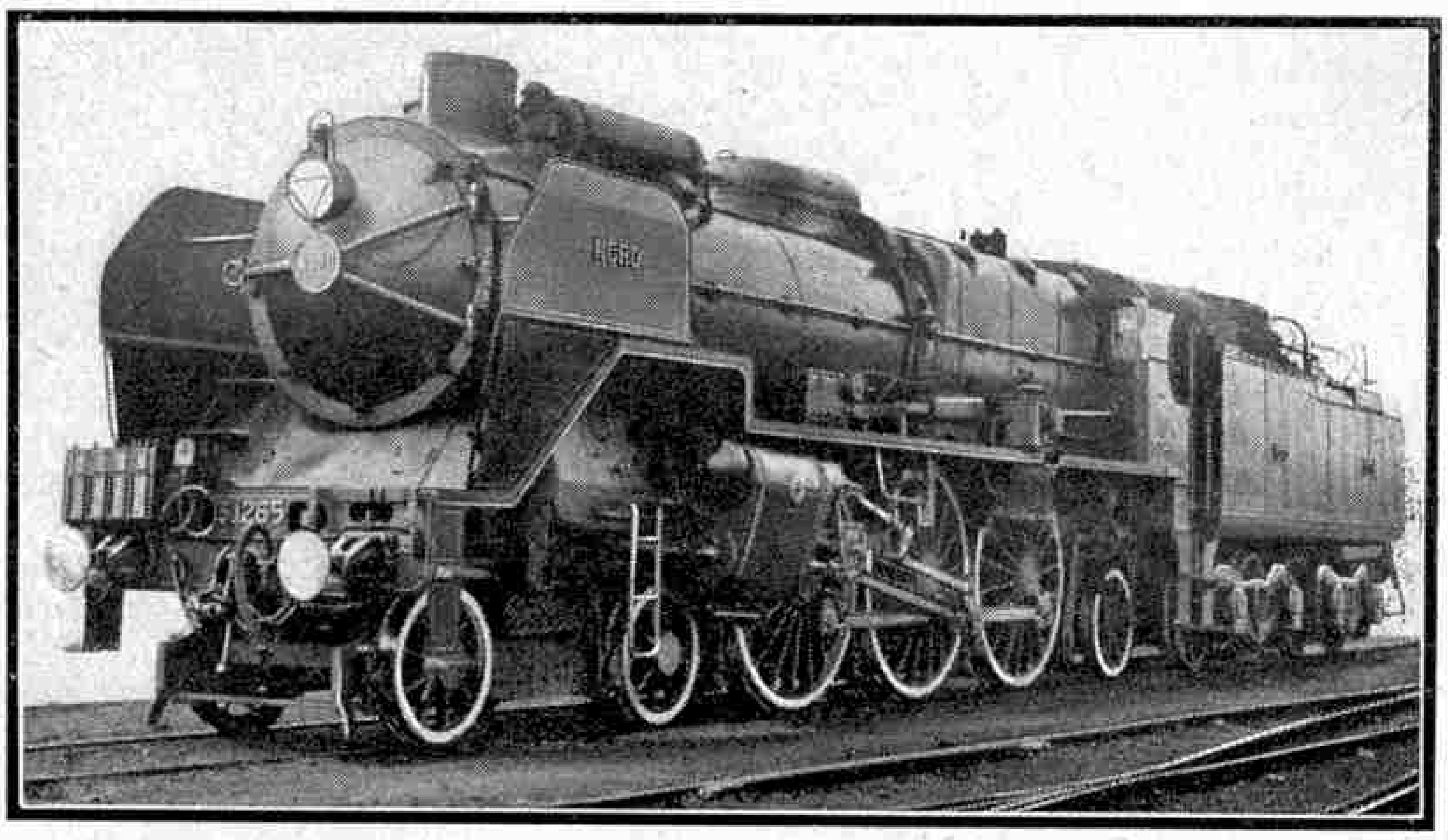
We passed Port le Grand at 75 m.p.h., slackened to 64½ through Abbeville, and were doing a steady 75 m.p.h. again beyond Longpré when there came a severe out-of-course slowing to 35 m.p.h. at Hangest, where an underline bridge was under repair. Abbeville, 75.2 miles from the start, had been passed in 72¼ minutes, and prior to this check already six minutes of our late start were regained. With 45 per cent. cut-off in the high-pressure cylinders Blondel got his engine into speed again very rapidly, and at Picquigny, four miles beyond the site of the slack, we were doing 69 m.p.h. We then continued along the winding track in the valley of the Somme at round about 72 m.p.h. Soon the spires of Amiens Cathedral were silhouetted like two slender lances against the sky; we were through St. Roch, 101.8 miles from Calais, in 96½ minutes, and then, with brakes going on and lights up in the cab, we dived into the first of a series of tunnels.

After one or two breathing spaces we finally emerged, rounding the sharp curve into Amiens station. The speed was barely 25 m.p.h., and in spite of the check at Hangest, Blondel had actually regained another half minute from Abbeville to Amiens; the 103 miles from Calais had taken 98¾ min. instead of the 105 min. booked, and our net time was only 96 min. Speed had now to be recovered up the long ascent to Gannes. The gradients are never steeper than 1 in 250, but 25 miles of continuous collar-work are not to be despised, especially on a long non-stop journey with no chance of picking up water at speed. As far as No. 3-1252 was concerned, however, we might have been running on a level track, for the 26.9 miles from Amiens to the summit were wiped off in 26¾ min.


Before the start of the run; "Super-Pacific" No. 3-1252 backing down to the train at Calais Maritime station. The indicator bearing the train number "78" is prominent over the right-hand buffer.

On clearing the station at Amiens, the high-pressure cut-off was increased to 72 per cent. for a short space, and with the regulator open wider than ever before when working compound we got away very smartly. Although high-pressure cut-off was soon down to 44 per cent., we gradually accelerated to 61½ m.p.h. on the 1 in 333. Blondel took advantage of the dip beyond Boves to link up to 40 per cent.; we touched 65 m.p.h. here, and then went up the next 16 miles of 1 in 333 ascent at an average speed of 64 m.p.h.! This was amazing work with a 515-ton load. The absolute minimum speed was 62 m.p.h., and now, in 1¼ miles of level past Breteuil, No. 3-1252 raced away to 68½ m.p.h. The last 3 miles are at 1 in 250, but the engine made light of them and finished a brilliant climb by storming over the summit at 64½ m.p.h.

Beyond Gannes summit the driver took full advantage of the higher speed limit enforced between Amiens and Creil. The regulator was set so as to give the merest breath of steam through the low-pressure cylinders, and with 40 per cent. in the high-pressure again we were soon galloping to some purpose. Driver Blondel delightedly called me over to his side of the cab to see the speedometer; the needle was hovering about the 130 mark, though actually we did not quite reach the limit, which in English units is equal to 81 m.p.h. The highest speed I clocked off the kilometre posts was 79½ m.p.h., and I calculated we should reach Paris in some minutes under 3 hours.


"Super-Pacific" No. 3-1265. This photograph shows the characteristic appearance of these remarkable engines and a number of the external gadgets with which they are provided.

Then, just as we were making such progress, a most unexpected thing happened. After passing Clermont, still going a merry 78 m.p.h. the driver and inspector noticed symptoms of something not quite in order at the front end. The engine was eased a little, putting the low-pressure cylinders out of action, and we ran on through Liancourt at about 66 m.p.h. Approaching Creil signals were against us, and Inspector Baudry took advantage of the slower speed to climb out along the running board to investigate. He came back with the news that one of the low-pressure valve rods was showing signs of fatigue; these signs were very slight indeed, but enough to make it unwise to use the low-pressure cylinders.

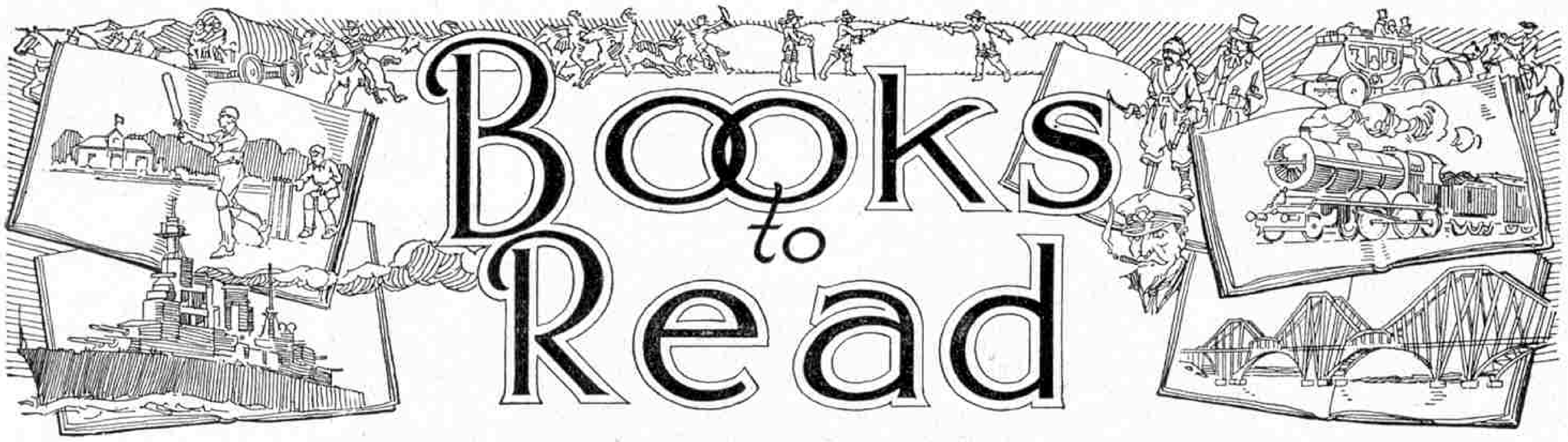
During my experiences on the footplate I have found that these "Super-Pacifics" will run to good purpose with only two cylinders on level or favourable stretches, but now it was a different matter. Baudry came across to explain what I knew, alas, to be the case—ahead of us was a 12-mile bank, almost entirely at 1 in 200! This very predicament revealed to me yet another astonishing attribute of these astonishing locomotives. By means of a special by-pass valve the driver isolated the low-pressure cylinders, thus leaving the engine to run on the high-pressure cylinders alone. Now for the first time in all my footplate experience of these engines I heard the exhaust, and in no uncertain style either, for we literally roared out of Creil, on three-quarter regulator and 50 per cent. cut-off.

We had done magnificently up to now. Creil, 152.9 miles from the start, had been passed in 146 min., 8 min. inside schedule time in spite of all checks, but now I was afraid we should go down heavily, with two cylinders only 17¼ in. in diameter by 26 in. stroke. But in this respect I was completely disillusioned. By Chantilly No. 3-1252 had accelerated to 41 m.p.h.; a slight signal check beyond that place brought us down to 35, but the engine accelerated again and we topped Survilliers summit at 38 m.p.h. With an engine having, now, an available cylinder volume about equal to that of the tiny "Jumbo" 2-4-0s of the former L.N.W.R., this was a phenomenal achievement. We were now only just on the wrong side of "even time," the 165.7 miles from Calais to Survilliers having taken 166 min., but once over the top Blondel went "all out" for Paris.

Fireman Mantez had kept up the boiler pressure splendidly during this unexpectedly heavy period and even now there was little easing of the engine. It took over 3 miles of 1 in 200 descent in which to attain 60 m.p.h., with No. 3-1252 sounding a roaring tattoo that must have roused the neighbourhood for miles around! Then, at Louvres, cut-off was reduced to 40 per cent. By Goussainville, the next station, the engine was back to something approaching her normal stride, and Baudry, who had been watching the speed indicator, shouted across, "*Cent dix!*" and followed it up with a "*Hooray!*" We were doing 110 kilometres per hour, that is 68½ m.p.h. On the 1 in 200 descent the big "Pacific" was really going now, and accelerated steadily till we reached 71½ m.p.h. at the foot of the bank.

We swept through St. Denis, 180.3 miles from the start, in 180¾ min., and with a clear road into the terminus we should still have finished 4½ to 5 min. inside schedule time. But running abreast of La Chapelle engine sheds adverse signals were sighted ahead, and we were practically at a stand before the signal cleared. The line is rising quite steeply in the last few miles, and with only two cylinders available our big 515-ton load took some getting under way. But in spite of all we steamed into the Gare du Nord and stopped dead in 188¾ min., 1¼ min. inside schedule. On a run delayed three times by signal, twice by engineering operations, and, to crown all, a mishap to the engine, to gain on booked time was a really superlative achievement.

I have already emphasised the slightness of that mishap, but the prompt measures taken to counteract its effects, and the response of the engine, were probably the most outstanding features of the run. Such a mishap on a three or four-cylinder simple engine would have necessitated its removal from the train; there would have been delay at Creil while the most suitable engine in the neighbourhood was commandeered and attached; and then, inevitably, a considerable loss of time on getting under way. But the very complication of these wonderful compound "Pacifics," with their multiplicity of controls, enabled Driver Blondel to coax No. 3-1252 through without loss of time. Our net time from Calais was indeed 9 min. under schedule.



Books to Read

Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/- for postage to the price. Postage on different books varies, but any balance remaining will be refunded.

"Watching Wild Life"

By Phyllis Bond. (Longmans. 6/- net)

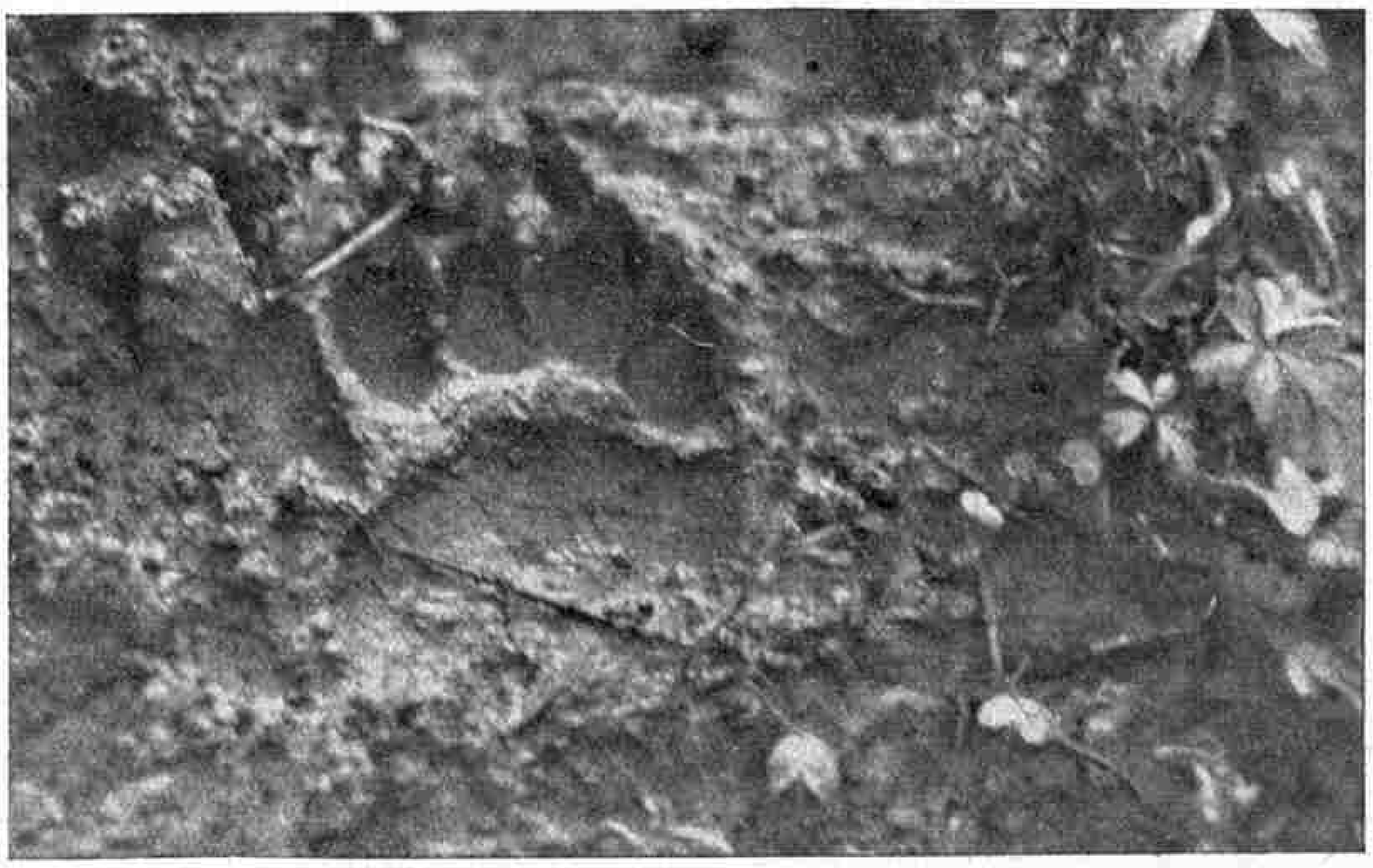
During the past few years there has been an unending succession of books dealing with the life stories of innumerable creatures of the wild. In this book Miss Bond leaves the beaten track. She does not set out to describe the birds and other creatures to which she refers, but to show her readers the best methods of observing the ways of these creatures for themselves.

Birds occupy the larger proportion of the book; and successive chapters tell how and where the birds and their nests are to be found. The author divides bird watchers into two classes—those who sit still in some promising place and wait for something to turn up, and those who set out in search of wild creatures, following them from place to place. She gives hints that will be of the greatest practical value to beginners of both types, and shows how easy it is to overlook things that are, so to speak, directly under one's nose.

Elusive as are the small creatures of the wild they nevertheless leave behind them unmistakable traces of their presence. For instance, partly-devoured fir cones lying on the ground tell, according to the manner in which they have been eaten, of the squirrel, the crossbill, or mice. Even more interesting are the tracks left by various creatures. The author shows how the tiny paw-marks can be identified, and how the trails can be followed up to the private haunts of the creatures that made them.

A particularly interesting chapter deals with the songs of birds, and gives really practical hints on how to identify them. Then comes a chapter entitled "The Fascination of Holes," dealing with what might be described as the front doors of a variety of small creatures ranging from owls to blue-tits. Finally there are chapters on the flight of birds, different types of wing feathers, and the fascinating tiny noises of the wild that are always present for those with ears to hear, together with methods of getting acquainted with birds.

This is a well-illustrated book that can be thoroughly recommended to all who care for the creatures of the countryside.



The unmistakable square print of the badger, showing the five toe-marks nearly in line. This illustration is reproduced from "Watching Wild Life," reviewed on this page.

"Tropical Aquarium Plants and Fishes"

By A. Laurence Wells. (Frederick Warne. 3/6 net)

A tropical aquarium is a never-ending source of enjoyment, for the fish with which it is stocked usually are brightly coloured and interesting in their habits. In this book Mr. Wells shows that the hobby is neither expensive nor difficult. After an introductory chapter on its delights, he explains how to set up a tank and the necessary heating apparatus, and to stock it with suitable plants and fishes. He gives much useful information on feeding and general treatment, and includes a special section on typical fishes, such as the Rainbow Fish from the rivers of South America, which is exquisitely marked and coloured, and the Neon Light Fish, which was only discovered in 1936 and derives its name from a flashing blue-green streak across its back.

The book has a coloured frontispiece and 67 line illustrations.

"The Air Record Breakers"

By J. F. C. Westerman. (Ward Lock. 3/6 net)

Mr. Westerman has a reputation for stirring adventure stories in which aeroplanes play a great part, and his new book is well up to the standard expected of him. A fast aeroplane is invented and built in a secluded part of the New Forest by Dick Slaidburn, and his chum Billy Trevours discovers a new fuel that is superior to petrol. The two set out on a world-wide test flight, which takes them to Africa, Panama, New Zealand and Australia. Spies and agents of foreign governments attempt to steal the machine, or at least to discover its secrets, but they are beaten off and everything ends satisfactorily. This thrilling story is illustrated by four full-page plates.

"How They Sent the News"

By J. W. McSpadden. (Harrap. 7/6 net)

How messages have been sent through space, by sound, sight, or electric signal, is the subject of Mr. McSpadden's stories. The author begins thousands of years ago, with signs and marks made on the trail by cave men to indicate the presence or absence of game, and ends with a glance into the future, when television will enable us to see what is happening at almost any point on the Earth's surface. The stories themselves are interesting, and together give a complete survey of all the ingenious ways in which men have communicated with each other.

The first story deals with the messages and drawings engraved by prehistoric man on the walls of caves in southern France and Spain, and gives a fascinating glimpse of life in the Stone Age. Then follows the tale of Gideon and his little band of men, 300 strong, who used torches and trumpets as signals with great effect in routing the Midianites. The beating of drums in the African jungle, and the smoke signals of the North American Indians are next dealt with, and there are tales of lighthouses and lightships, the heliograph and the semaphore.

The discovery of electricity gave a new turn to communications. We read of the struggle of Morse to perfect his telegraph, and follow the persistent efforts of Cyrus Field and Charles Bright to lay the first ocean cable across the Atlantic. With Alexander Bell we listen to the first telephone message, and recapture the thrills of Marconi and his assistants when they received the first radio signals from Europe to America. Then the story of the development of radio is told in episodes that mark great advances, or show its powers in dramatic circumstances, such as the first flight across the Pacific Ocean or the rescue of Admiral Byrd when he fell ill in his lonely post in the Antarctic. Finally we leap forward to 1950, with a television transmitter broadcasting the hearing of a law-suit in which a witness explains the development of that marvellous way of sending the news.

These great achievements of the past and the possibilities of the future are vividly outlined by Mr. McSpadden. His somewhat dramatic method emphasises the outstanding features of the triumphs he describes, and his book is one that all readers will thoroughly enjoy. It is illustrated by 16 excellent full-page plates.

"Sailing Ship Rigs and Rigging"

By Harold A. Underhill
(Brown, Son and Ferguson. 7/6 net)

These publishers have placed lovers of sailing ships further in their debt by the production of this book. It opens with a description of the various rigs, with 32 drawings of different craft designed to show the special features of each rig. The second section gives a splendid collection of sail and rigging plans dealing with all rigs and including many famous vessels, such as the five-masted ship *"Preussen,"* the four-masted barques *"Archibald Russell"* and *"Pommern,"* and the cutter yacht *"Britannia."* The plans in each case are accompanied by interesting and accurate details and notes. This brings us to a useful description of square sails, with a series of particularly good lettered and numbered diagrams, and a very full glossary of terms used in connection with masts, spars, sails and rigging.

It would be difficult to imagine a book of more practical value to anyone interested in the now rapidly vanishing sailing ship.

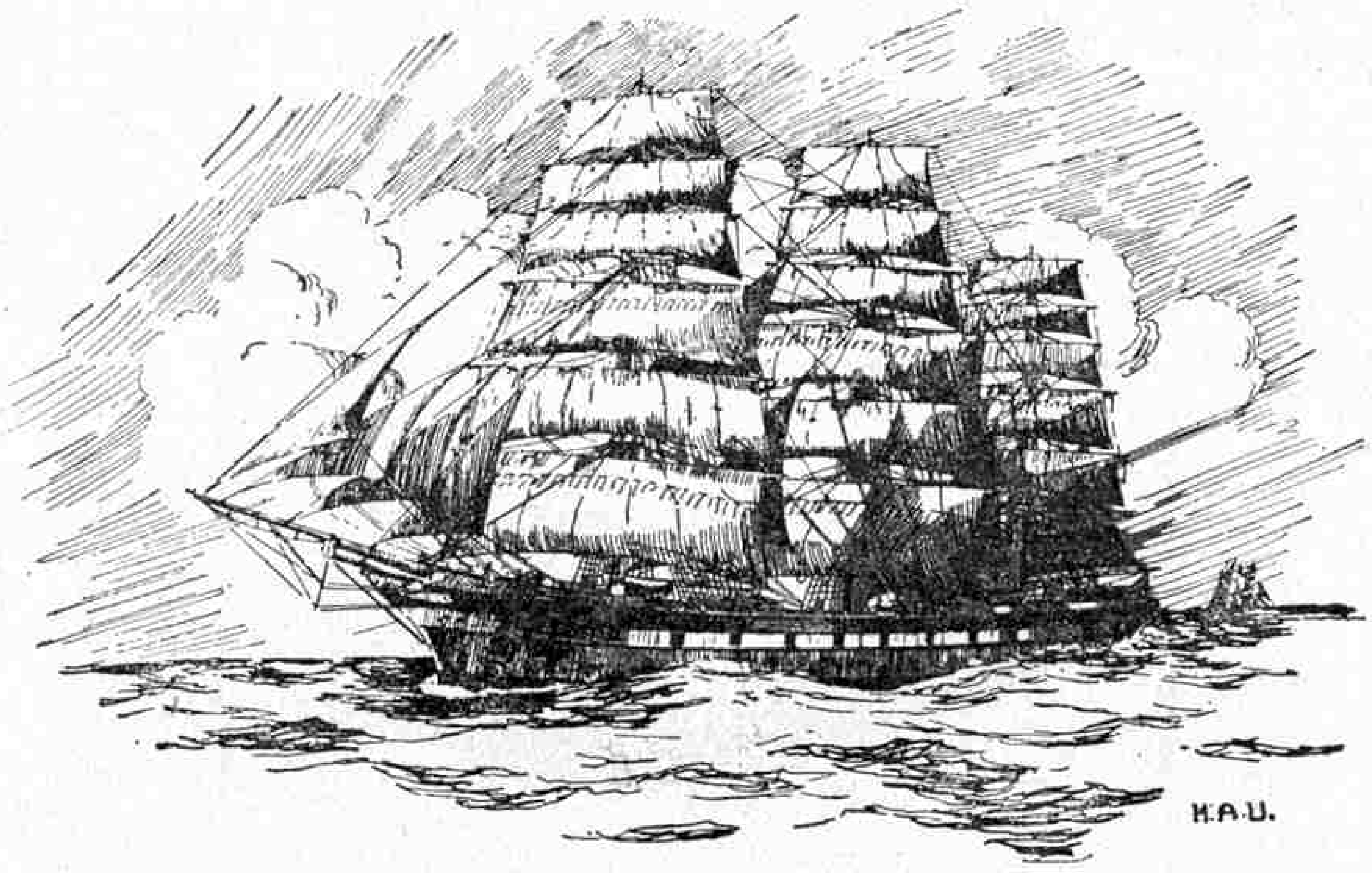
"The Island in the Mist"

By Franklyn Kelsey
(Harrap. 7/6 net)

Here is a novel adventure story for boys, founded upon serial thriller plays that have been broadcast by every Regional station in Great Britain.

The *"Island in the Mist"* is in the Antarctic, far to the south of India, and has never been discovered by Europeans because it is always surrounded by fog, although the island itself is clear. It is inhabited by a strange white race with a highly developed civilisation, the Chieftain of whom maintains communication by telepathic means with the monks of a Ceylonese temple. These mysterious beings have even mastered the art of flying by the discovery of a metal that can be made to lose its gravity, and with the aid of a belt of this material and wings to take advantage of air currents, their flying men venture boldly into the air. Other beings are specially trained as swimmers and are veritable fish-men.

Dick and Jack Armitage accompany James Armitage their father, on a voyage to the island, which they are privileged to visit because of services rendered by James Armitage's grandfather. There they become mixed up with rival factions, while to complicate matters they have with them disguised as a cook a Chinese who is determined to seize treasure that he knows to be hidden on this mysterious island. A thrilling struggle for power follows, partly in Great Britain, which the villain of the story reaches in a wonderful airship, and this rises to a climax when one of the combatants threatens to ruin London in order to assert his power over the whole world. He is foiled by the determination of James Armitage, who has learned his secrets from the aged Chieftain, and after many adventures is able to construct machines with which to destroy the airship and its occupants.



A three-mast ship. From "Sailing Ship Rigs and Rigging," reviewed on this page.

"Relativity and Robinson"

By C. W. W. (Technical Press. 3/6 net)

It is now more than 20 years since Einstein gave us a new view of the Universe of which our Earth forms a part. His ideas still remain a mystery to most people, and this little book is intended to explain them in very simple terms, without going deeply into details or into mathematics, and will be found of absorbing interest by older readers who are interested in modern science.

Robinson represents the "very simple people" to whom the book is addressed. He is taken in hand by a mathematician and a friend, who talk to him, answer his questions and gently lead him along to realise that there are many things that can only be explained by introducing time as a fourth dimension in a space-time composite. The peculiarities of this space-time are difficult to grasp, but Robinson and the author's readers will have a good idea of what is involved after reading the entertaining parables and illustrations in the book. In this they are helped by useful diagrams and line drawings that help them to picture the strange new world of relativity, as far as this is possible for ordinary readers, and to realise how it has been discovered.

"The Broom and Heather Boys"

By R. A. H. Goodyear. (Ward Lock. 2/6 net)

School tales vie with adventure yarns in their attraction for boys, and readers will revel in this typical story by Mr. Goodyear. The Brooms and the Heathers are rival houses at Danesland Ambo. Rivalry is changed to bitter enmity when "Plumpy," a Heather and the son of the Earl of Thridberg, is pushed into a fish pond by a Broom. As a result the Earl's estate is placed out of bounds for the Brooms, while the Heathers are still permitted to go there. The ensuing rift seriously affects every side of school life, and after many complications the Headmaster of the School resigns. How all the difficulties are settled and the School once more becomes united makes a very interesting story.

There is much in the book besides the actual story. Cricket plays a prominent part, and there is a full measure of fun, adventure, and exciting incident of the kind that boys like. There are four full-page illustrations.

"The Story of Tunnels"

By A. Black. (McGraw Hill. 10/6 net)

Mr. Black's story of the triumphs of the tunnel engineer is attractively written in simple non-technical language. It is packed with interesting and accurate information on the world's famous tunnels, and contains thrilling accounts of dangers and difficulties that have been overcome in underground work, and of amazing adventures of men engaged in it.

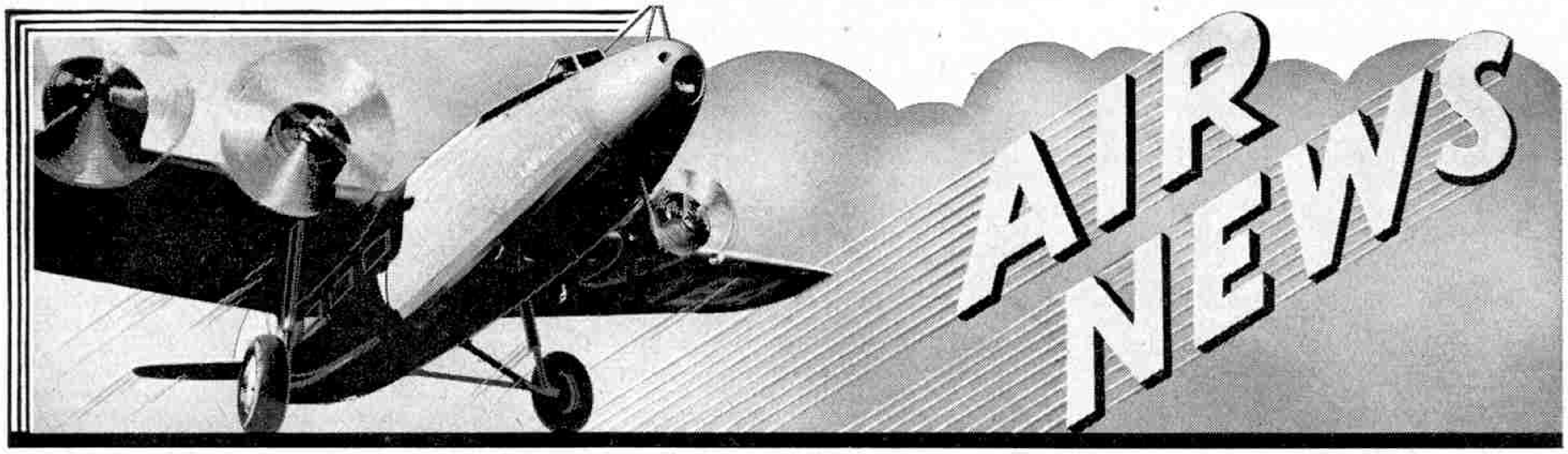
Tunnelling is not a new branch of engineering. The earliest tunnel recorded was driven under the Euphrates at Babylon more than 4,000 years ago, and it is astonishing to learn that the next tunnel under a river bed to be completed was the Thames Tunnel of 1842. Other ancient peoples, especially the Romans, also were tunnel builders.

Modern tunnelling dates from the 17th and 18th century, when canals were being built on a large scale. This stage ushered in the era of great tunnel building, which began a little more than 100 years ago, when Sir Marc Isambard Brunel invented the shield used in tunnelling under the Thames. Since that time many great tunnels have been bored through rock, earth and clay, or in the silt of river beds, and their stories are fully told by Mr. Black. He describes the first "shield" tunnels and those by which railways penetrate the Alps and other great mountain ranges. The construction of underground railways in great cities is dealt with, and accounts are given of tunnels, many of them of very great length, that form part of water supply systems.

Some of the most interesting stories in the book describe the construction of road and railway tunnels under rivers. In this section Great Britain is well represented by the Thames Tunnel, a great pioneer effort, and the tunnels under the Severn and Mersey, the latest of which, Queensway, is the greatest underwater tunnel in the world. All these are adequately dealt with, as are the tunnels under the Hudson and East Rivers of New York. These lie in silt, and water and mud often broke into the workings. On one of these occasions a workman actually was blown out of the tunnel by the compressed air used in its construction, and came to the surface of the river practically unharmed. Other interesting bores described are those constructed in connection with great hydro-electric power and irrigation schemes.

It is impossible to mention all the great tunnels that are dealt with in Mr. Black's book. Every type that has yet been constructed is fully represented, the purpose of each tunnel and the methods used in constructing it being fully explained in such a manner that the wonderful progress of the last century is well illustrated. A final chapter deals with the great project of tunnelling under the English Channel, a dream of the future that may yet become a reality.

The book is exceptionally well illustrated by means of 46 photographic reproductions on 25 full page plates.



R.A.F. Long-Distance Aircraft Units

The world's long-distance flight record is held by Russia, for a non-stop flight of 6,306 miles, from Moscow to San Jacinto, California. It was previously held by Great Britain, and hopes that it will be regained for this country have been strengthened by an Air Ministry announcement that an R.A.F. long-distance aircraft unit has been formed "for the investigation and development of the technique of long-range flying." The unit is under the command of Wing Commander O. R. Gayford, D.F.C., A.F.C., who with Flight Lieut. G. E. Nicolette gained the record for this country in 1933 by a non-stop flight of 5,309 miles from Cranwell to Walvis Bay, South West Africa. The aeroplane then used was a special Fairey monoplane fitted with a Napier "Lion" engine.

The unit has been equipped with three Vickers "Wellesley" low wing monoplanes, fitted with Bristol "Pegasus" engines and variable pitch airscrews. The "Wellesley" is a long-range bomber capable of a top speed of 228 m.p.h. at 17,000 ft., and is one of the modern types being supplied in quantity to the R.A.F. A series of trial flights along the England-Australia air route will be carried out during this spring.

21 Years as an Air Pilot

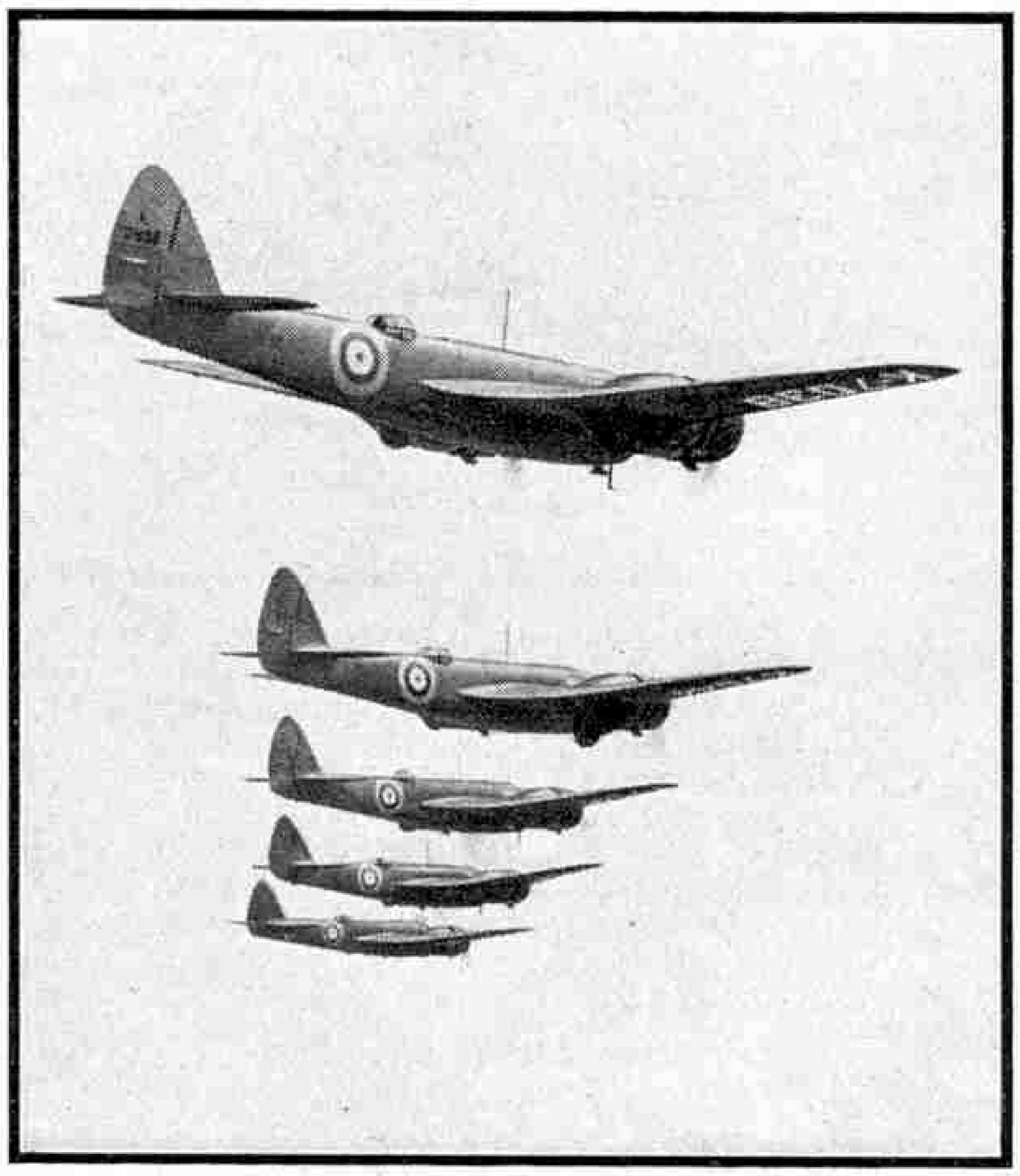
Captain H. H. Horsley, one of the veteran "million miles" pilots of Imperial Airways, recently completed 21 years as a pilot. In that time he has flown nearly 1,400,000 miles and has spent over 13,000 hrs. in the air. After serving with the R.N.A.S. during the War he became a pilot with the British Marine Air Navigation Company, one of the pioneer British air transport concerns, and when it was merged with Imperial Airways in 1924 he became one of that company's first pilots. Since then Capt. Horsley has flown Imperial Airways air liners on many parts of the European and Empire routes, and it is his boast that he has handled every type of aircraft, both landplane and flying boat, that the company has had in operation.

A Correction

By an unfortunate accident the illustrations of the Northrop and Dewoitine monoplanes in last month's *"Air News"* pages were transposed. The illustration of the Northrop machine used as a flying test bed by the Bristol Aeroplane Co. Ltd., should have appeared on page 24, and that of the Dewoitine D.510 Single-Seater Fighter on page 25.

Record South Atlantic Flight

An interesting record flight from Paris to Santiago, Chile, was carried out last November by M. Paul Codos, the chief pilot of Air France, and three others. The purpose of the flight was to study operating conditions over the South Atlantic and the company's South American air routes, and to demonstrate how the Air France mail service could be accelerated.



Bristol "Blenheim" Bombers of No. 114 (Bomber) Squadron, R.A.F., flying in formation over Wyton. Photograph by courtesy of "Flight."

The flight was made in stages, the first halt after leaving Le Bourget being Marseilles. The next stop was Dakar, where the aeroplane began the long trip over the South Atlantic to Natal, Brazil. Very squally weather made the ocean crossing unpleasant. From Natal the flight was continued to Buenos Aires, and then over the lofty Cordilleras to Santiago, 7,862 miles from Paris. The full trip took 58 hrs. 41 min., of which 51 hrs. 45 min. were spent in the air.

The aeroplane used was a Farman 2231 high wing braced monoplane, 109 ft. 2 in. in span, and 72 ft. long. It has four Hispano-Suiza 12 XIrs water-cooled engines, mounted in tandem pairs below the wings, one pair on each side of the fuselage, and is capable of a top speed of 216 m.p.h. at 7,850 ft.

England-Australia Flying Boat Route

The survey flights of the Imperial Airways' flying boats *"Satyrus"* and *"Cordelia"* as far as Singapore, reported in last month's *"Air News,"* have been followed by a survey flight over the entire route to Australia, and on to New Zealand, by the Company's Empire flying boat *"Centaurus."* This was the first time one of these fine aircraft had travelled beyond Singapore, and its arrival at Port Darwin just before Christmas created great interest there.

After Christmas *"Centaurus"* flew across the Tasman Sea to Auckland, New Zealand, on the first commercial flying boat survey over this important route. This is the preliminary stage in the opening up of a regular air service to link New Zealand with Australia and the general system of Empire air routes. The flying boat will visit Wellington, Christchurch, and Dunedin before returning to Australia, and it is of interest to note that her Commander, Capt. J. N. Burgess, is a native of Dunedin. It is calculated that by the time the flying boat arrives back home she will have flown a total distance of 30,000 miles.

Mr. Hudson Fysh, the Managing Director of Qantas Empire Airways, who operate the Singapore-Australia section of the Empire air route, recently flew back to Australia after spending two months in England arranging details of the forthcoming change-over from landplanes to flying boats. Before leaving he stated, in regard to the provision of flying boat harbours in Australia, that it was hoped to have sufficient equipment available for these aircraft to be operating through to Australia early this summer.

The introduction of Empire flying boats over the whole route will shorten the time occupied by a Southampton-Brisbane air journey from 12 to 10 days, and this time will be further considerably reduced as facilities for night flying become available.

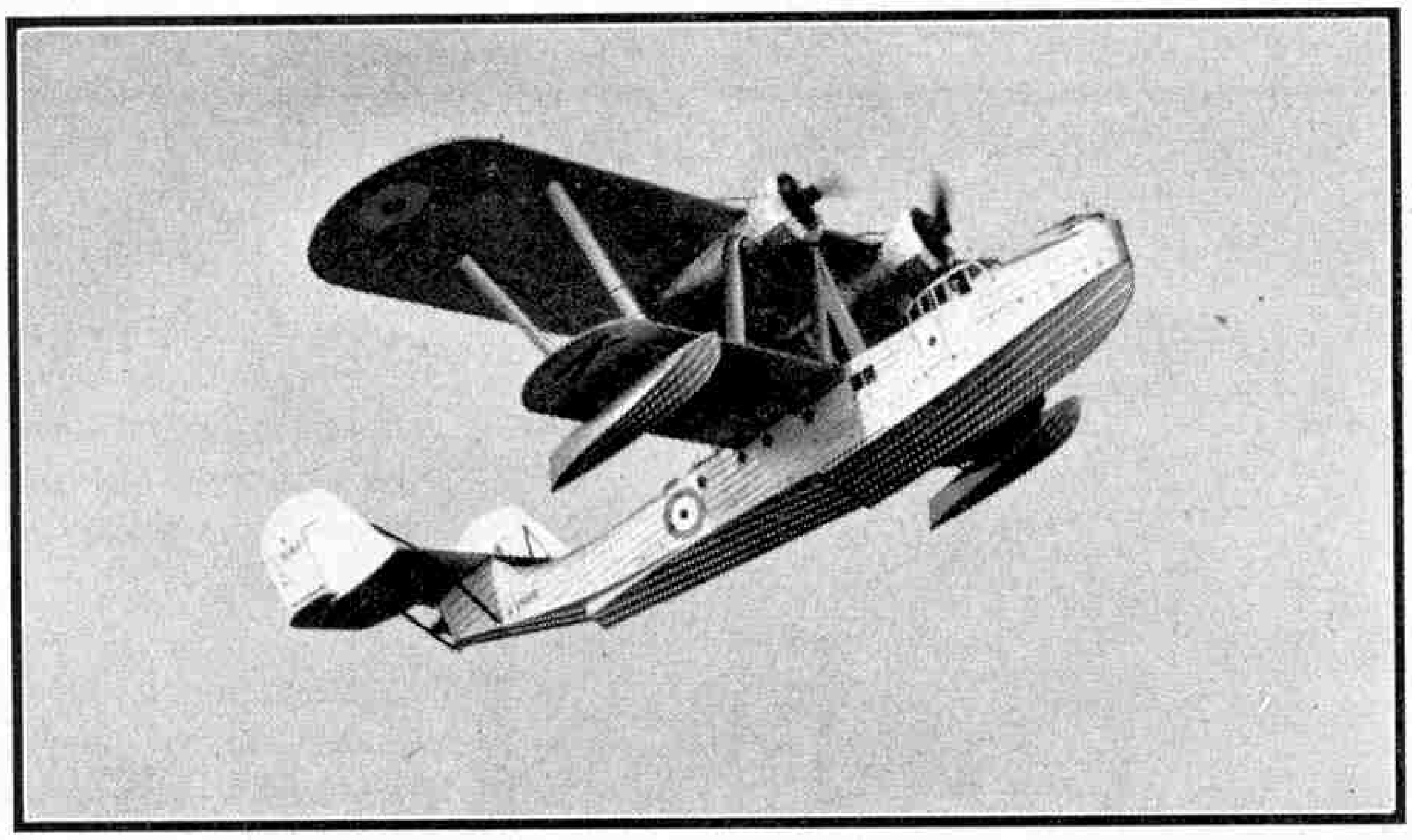
Le Bourget Airport

The airport at Le Bourget, France, has been considerably enlarged, and when the new buildings were officially opened recently by M. Pierre Cot, the French Air Minister, he declared the airport to be the largest in Europe.

The new main building is 700 ft. long by 100 ft. wide, and has a roof terrace large enough to accommodate 4,000 people. The airport now has runways 3,000 ft., 5,100 ft. and 7,500 ft. long.

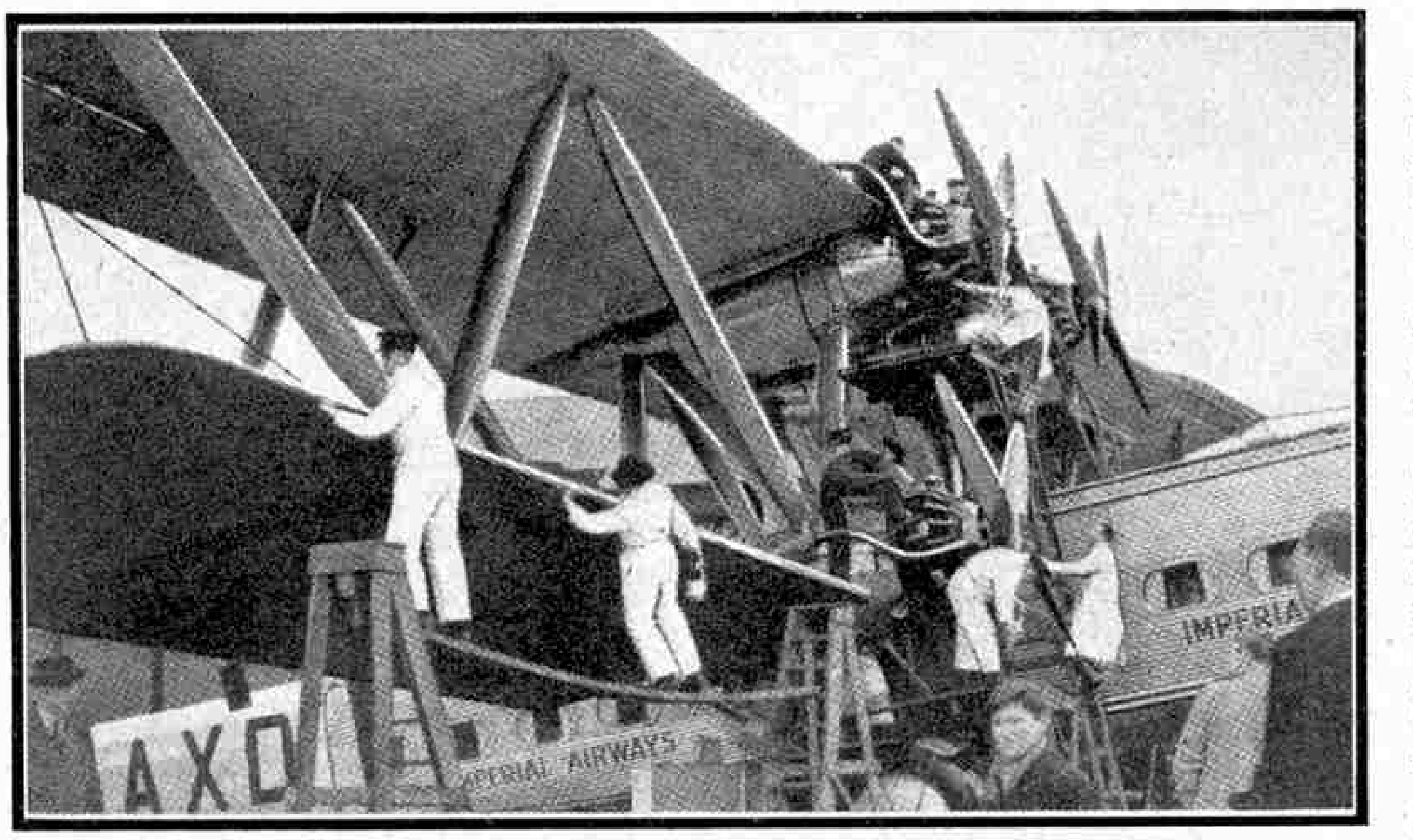
R.A.F. Formation Flight to Australia

A notable long-distance formation flight began on 2nd December, 1937, when No. 204 (General Reconnaissance) Squadron of the Royal Air Force took off from Mount Batten, Plymouth, to fly by stages to Australia, at the invitation of the Government of that country. The squadron are representing the R.A.F. at the celebrations of the 150th anniversary of the State of New South Wales, which began at Sydney on 26th of last month. They will be the guests of that State for about 11 days, and will depart on 7th February to fly a clockwise circuit of Australia, during which they will cover 9,000 miles. The tour will end at Derby, on the north coast of Western Australia, where the squadron will take-off about the middle of March for the long homeward flight. When they arrive back in England next May they will have flown fully 30,000 miles, and will have completed the longest formation flight ever undertaken by the R.A.F.



A Saro "London" Flying Boat. Five aircraft of this type have flown in formation to Australia, as described on this page. Photograph by courtesy of Saunders-Roe Ltd., Cowes.

The squadron consists of five Saro "London II" flying boats, each manned by a crew of six, two of whom are pilots, one a navigator, and the other three engineer, wireless operator and rigger respectively. The flying boats are equipped with radio, and each one is able to maintain communication with any of the aircraft in the formation. One of the flying boats is detailed as guardship to remain in constant radio touch with the Air Ministry and the Headquarters of the R.A.F. Command through which the squadron is flying, and hourly reports of the progress of the cruise are communicated to both these points by radio.



"Kilfrost" anti-icing compound being applied to "Horatius," an Imperial Airways liner engaged on the London-Paris route. Photograph by courtesy of Imperial Airways.

The Saro "London" is designed for open-sea reconnaissance and coastal patrol duties, and the upper illustration on this page gives a good idea of its general appearance. The two Bristol "Pegasus X" supercharged engines give the flying boat a top speed of 155 m.p.h. at 6,500 ft.

Luxury Air Liner for U.S. Millionaire

It is reported from Washington that an all-metal four-engined air liner capable of a top speed of 250 m.p.h. and a cruising range of 3,300 miles is being built for Captain G. Whittell, a San Francisco millionaire. The air liner will cost £60,000, and will be the most luxuriously equipped one in the world. It will have accommodation for 13 passengers, and will include a suite for the owner, bedrooms for four guests, a dining room and a lounge. Hot and cold running water will be available, and there will be a refrigerator for the storage of foodstuffs.

Air Mails Contract Renewed

Railway Air Services have again been awarded the contract for the carriage of mails on the principal British internal air route, from London to Glasgow, via Liverpool and Belfast. This is the third successive year that the contract has been placed with this company.

Since Railway Air Services was formed in 1934 its aircraft have flown more than 4,000,000 miles on internal routes, and over 1,000,000 of these miles were flown last year.

Mountain Tests of Aero Engines

The growing practice of air pilots employed on long-distance air services of flying at high altitudes in order to avoid disturbed weather conditions at lower levels has stimulated research into the working of aero engines at great heights. In France an aero engine test bed has been installed on Mount Lachat, at St. Gervaise-les-Bains, at a height of 7,000 ft. above sea level, and a second one is to be erected at a height of over 4,000 ft. on Mont Blanc. The extensive research to be carried out at these test benches include the working of variable pitch propellers at high altitudes and the freezing-up of engine carburetters.

New Aircraft for Swiss Air Force

The Swiss military authorities have been carrying out trial flights at Duebendorf with two Heinkel He 112 single-seater fighters. These machines have proved so satisfactory that it is expected the type will be adopted as part of new equipment to be obtained for the Swiss Air Force.

The Heinkel He 112 is capable of a speed of 250 to 280 m.p.h., and is fitted with a Junkers "Jumo 210" water-cooled engine.

Transporting Helium for New Zeppelins

A total of 7,060,000 cu. ft. of helium will be required to fill the gasbags of the new Zeppelin airship LZ.130. This will be purchased from the United States, and the Government of that country has authorised the sale of the gas to Germany. Special steel tanks for the transport of the gas are being built, and these will be shipped to the United States to be filled.

The passenger accommodation of the LZ.130 has had to be much reduced to compensate for the heavier weight of the helium, to be used instead of hydrogen in the gasbags.

Preventing Ice Formation on Aircraft

Imperial Airways have for several years been carrying out experimental work to devise a really effective means of preventing ice formation on the wings of aircraft. They are now making extensive use on their Empire flying boats and European air liners of an anti-icing compound called *"Kilfrost,"* and the lower illustration on this page shows the compound being applied to *"Horatius,"* a Handley Page air liner operating on the London-Paris route. It was used on the Empire flying boat *"Cambria"* when that aircraft made the last of the Atlantic experimental flights last summer. The compound was applied before the flying boat left Botwood, and on arrival at Southampton her Commander reported that in spite of two hours of heavy rain over the Atlantic there was still a sufficient coating of the compound left to protect the aircraft.

"Kilfrost" is a paste that has been developed by Imperial Airways experts in conjunction with the inventor, Mr. J. Halbert. Its chief value lies in the fact that it prevents ice-formation, an easier process than that of ridding an aeroplane of ice after this has begun to form. In its earlier form it was used to prevent ice encrustation in refrigerating plants, and it proved so effective that soon its value in preventing ice formation in the air was realised.

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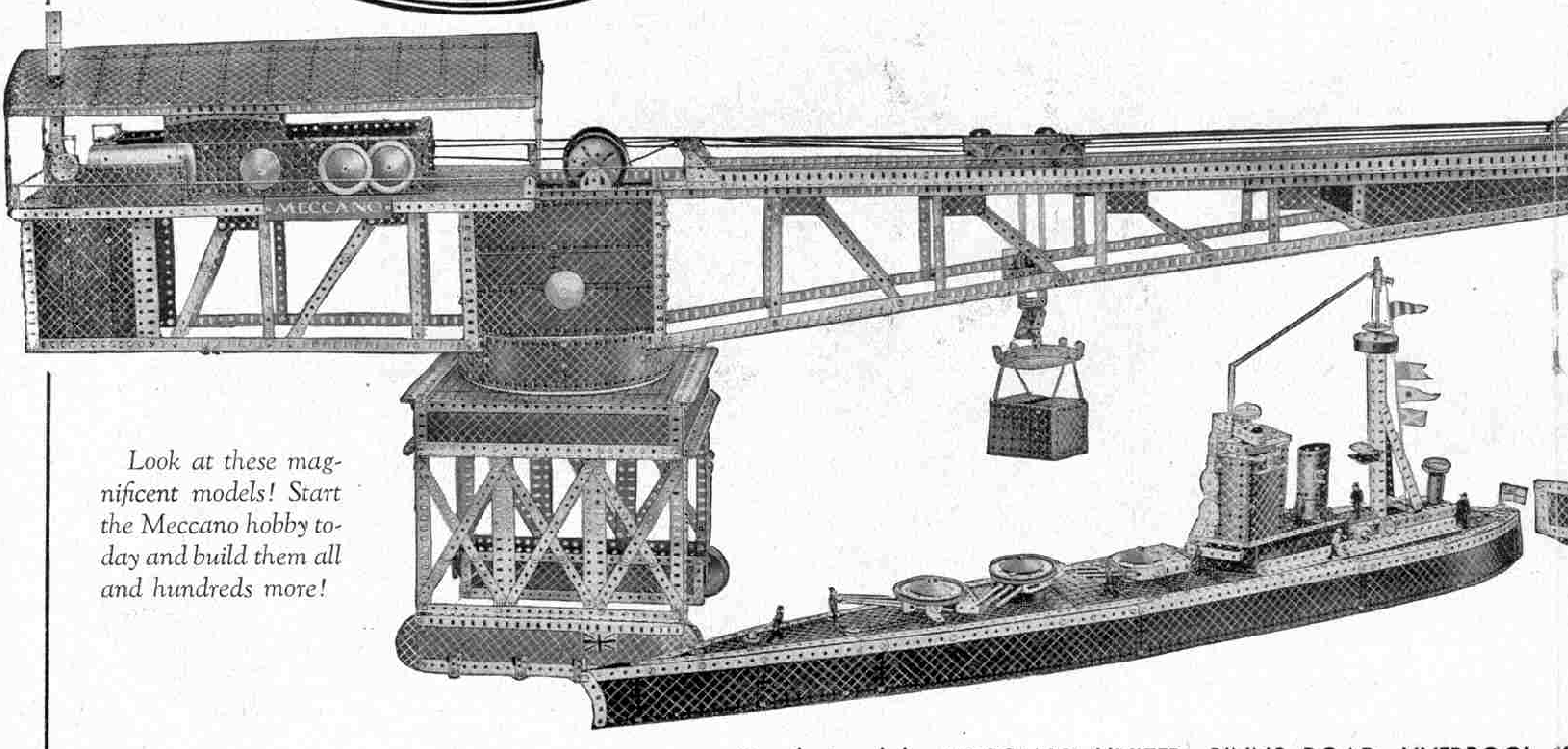

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the real thing. Afterwards the model can
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iver and a spanner, are also included in
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COMPLETE OUTFITS

	s.	d.		s.	d.
No. 0 Outfit	**3**	**0**	No. 6 Outfit	**24**	**0**
No. 1 ,, ...	**4**	**6**	No. 7 ,, ...	**35**	**0**
No. 2 ,, ...	**6**	**0**	No. 8 ,, ...	**66**	**0**
No. 3 ,, ...	**9**	**0**	No. 9c ,, ...	**95**	**0**
No. 4 ,, ...	**12**	**6**	No. 9w ,, ...	**125**	**0**
No. 5 ,, ...	**18**	**0**	No. 10 ,, ...	**255**	**0**

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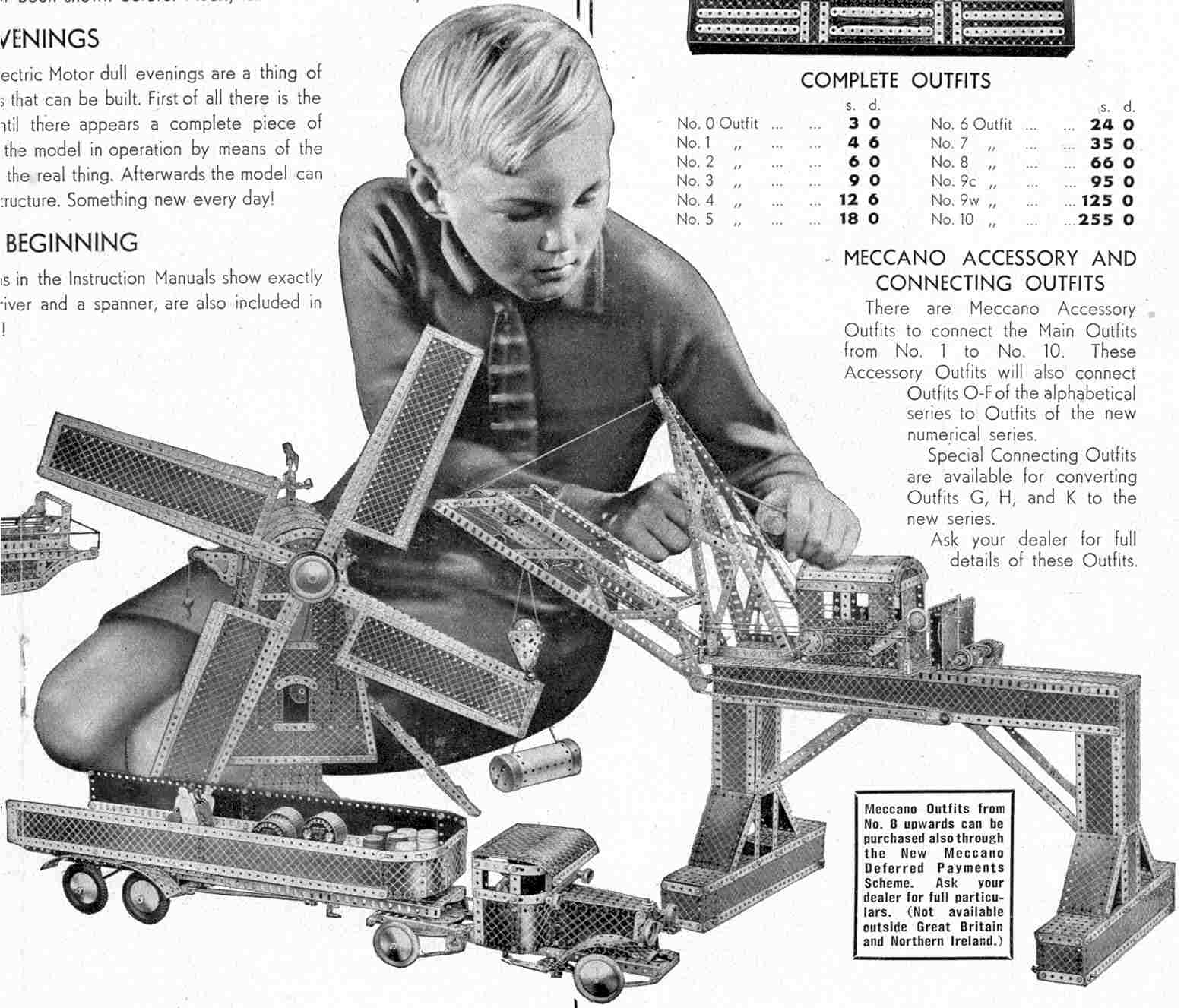
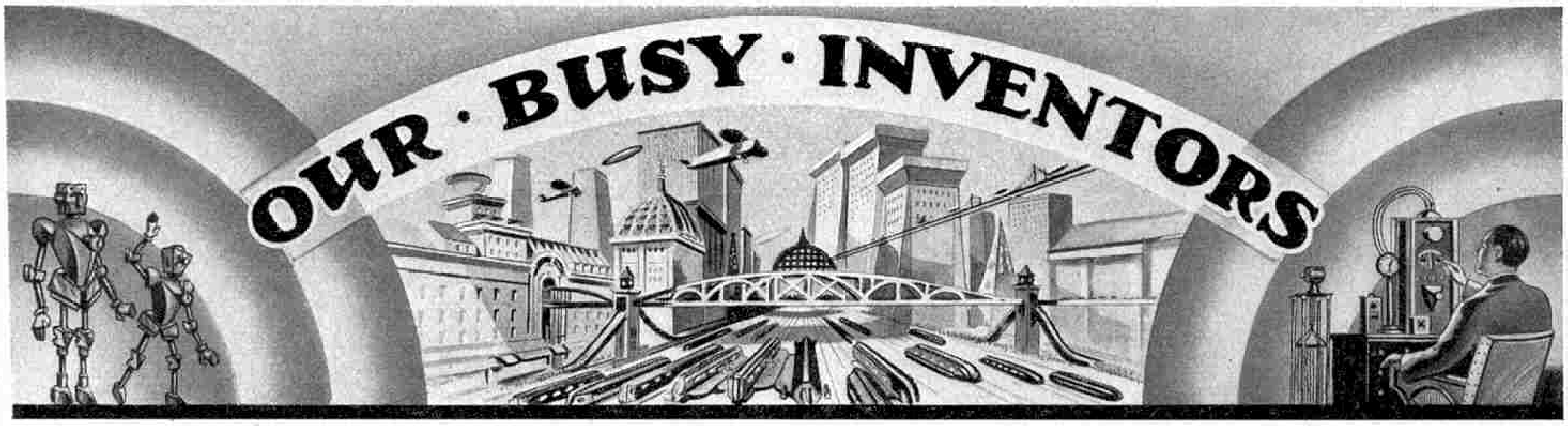


Meccano Outfits from No. 8 upwards can be purchased also through the New Meccano Deferred Payments Scheme. Ask your dealer for full particulars. (Not available outside Great Britain and Northern Ireland.)



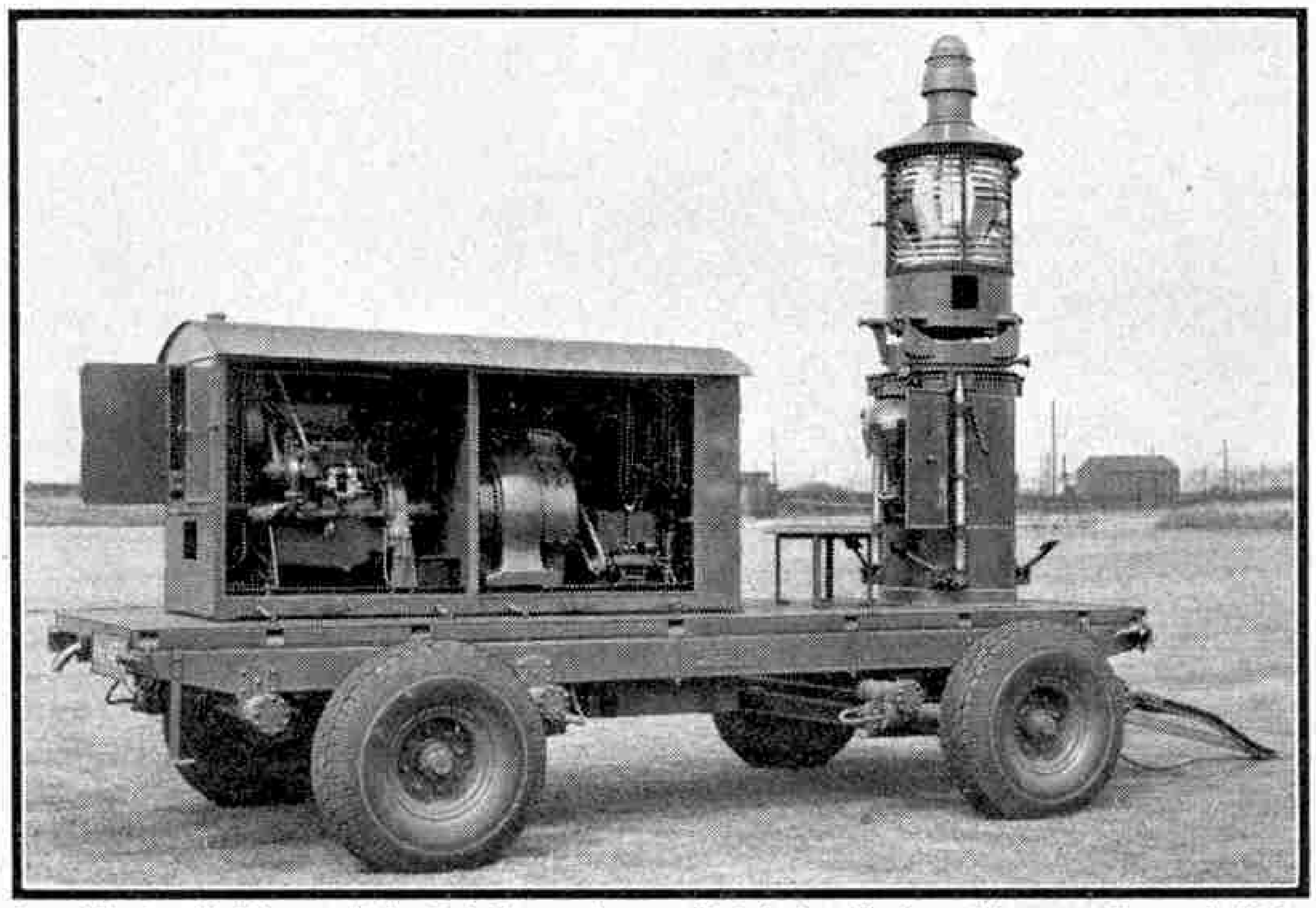
OUR · BUSY · INVENTORS

By P. A. Tent

Mobile Floodlight Beacons for R.A.F. Aerodromes

Efficient floodlighting is necessary before an airport or landing ground can be used by aircraft at night. The equipment may be of the fixed type, mounted in an elevated position such as on the roof of one of the airport buildings, or it may be mobile, so that it can be hauled into the best position for use.

The Air Ministry have bought some interesting mobile floodlighting units for illuminating the landing areas of R.A.F. aerodromes at night. These have been built by Chance Bros. and Co. Ltd., of Smethwick, Birmingham, and an illustration of one of them appears on this page. It consists of a four-wheeled trailer, on which is mounted an engine generator set and a vertical structure carrying the beacon. The trailer is of the Straussler type, which has independent torsion bar suspension for the wheels, and therefore is particularly suitable for towing over rough ground. The generating equipment consists of a 10-h.p. four-cylinder petrol engine coupled to a 5-kW D.C. generator. There is also a small battery charging generator, for recharging the small battery that is used for lighting side lamps, tail lamps and other auxiliaries.



A mobile floodlighting unit for R.A.F. aerodromes that is described on this page. It was built by Chance Bros. and Co. Ltd., Birmingham, to whom we are indebted for our illustration.

The beacon is designed to give a fan-shaped beam with a spread of approximately 180 deg. A 5-kW. filament lamp is employed as the illuminant, and a spare lamp is carried in the circular locker upon which the beacon is mounted. This locker also includes a prefocussing device by which the spare lamp can be focussed beforehand, so that in the event of the main lamp failing, the spare one with its holder can be placed into position ready for immediate use. Provision is made for both tipping and slewing the floodlight beacon to the required angle, the tipping adjustment being by foot control. The beacon is surmounted by an obstruction light that is fitted with an aviation red globe to comply with requirements.

An Ingenious Electro-Magnetic Separator

An ingenious electro-magnetic separator has been designed for the purpose of recovering iron and steel from the mixture of metallic and non-metallic waste that accumulates in machine shops. The material, which is known as "swarf," is fed on to a belt that travels slowly up a chute, the slope of the belt being so adjusted that the swarf moves downward along it by gravity in spite of the movement of the belt. The chute itself is a stationary electromagnet, with a series of poles of alternate polarity. There are steel inserts known as "feelers" in the belt, and the edges of these are highly magnetised as they pass over the magnet units below, with the result that particles of iron and steel are picked out and carried up by the magnets. As the poles are alternately north and south, the particles jump from one to the next instead of moving smoothly. This action turns the swarf over and makes certain that every particle of magnetic material comes into contact with the feelers and is thus separated from the waste.

When the iron reaches the top of the belt it passes into a neutral zone, where it is released and allowed to drop down another chute into a container.

The novelty in this separator lies in the use of a belt, with magnets below it, for material that may contain a large proportion of iron. Formerly a separator with a magnetic drum had to be used for such material, as magnetic chutes quickly loaded up the magnet bars. The new form works rapidly and continuously, and effects complete separation. It has been produced by the Rapid Magnetting Machine Company Ltd., Birmingham, and recently installed in several Birmingham iron works where it has proved very successful and economical in operation.

Cloth Permanently Waterproofed

Cloth can now be made waterproof by treating it with "Velan," a chemical compound produced in the Manchester Research Laboratories of Imperial Chemical Industries Ltd. Unlike rubber, cellulose lacquer and other waterproofing materials already in use, "Velan" does not make the cloth impervious to air, but renders it softer and more supple. The effects of the treatment do not wear off, no matter how often the fabrics are washed or cleaned, and even such liquids as tea, milk, and ink can be poured over with no apparent effect, for afterwards they can be shaken off as easily as dust from a dry cloth.

The velanising process is simple. The fabric is soaked with the solution, dried and heated to a temperature between 120-150 deg. C. This causes chemical action to take place between the "Velan" and the fibres of the material, and ensures the permanence of the waterproofing. The process is not an expensive one, and is particularly suitable for cotton and linen goods.

Solving a Garaging Problem

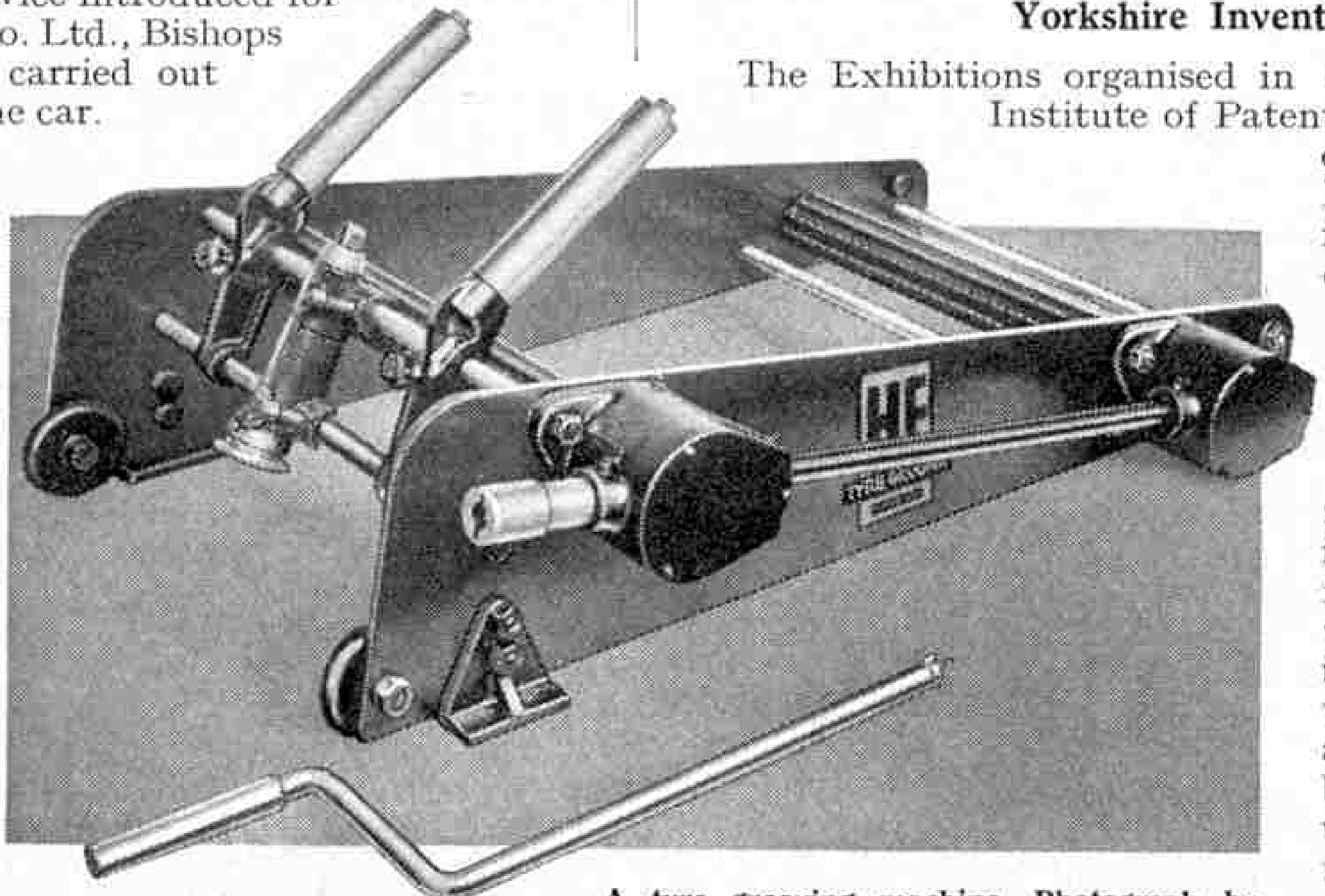
Many motor car owners in cities have no garages in their own grounds, nor sufficient space in which to erect additional buildings. In consequence they have to find accommodation for their cars at public garages, in many cases at great inconvenience.

An interesting scheme that will enable many owners to overcome this difficulty has recently been devised by a London firm, who have developed a form of underground garage. This consists of a watertight concrete pit in which works an electric lift, driven by machinery installed in the pit and controlled by push buttons inside the house. Normally the roof of the lift is level with the ground, and it can easily be tiled or otherwise treated to form part of a path or garden. A car can be raised to ground level in two minutes, and the gates of the lift are provided with an electrical device that prevents movement unless the gates are closed. The installation of suitable lighting makes garaging at night a simple matter.

Re-Grooving the Treads of Worn Tyres

A motor car with tyres that have been worn smooth by constant use is liable to skid on wet or greasy surfaces. The risk can be avoided by cutting new grooves in the treads, and the upper illustration on this page shows a device introduced for this purpose by Harvey Frost and Co. Ltd., Bishops Stortford. With it re-grooving is carried out without removing the wheel from the car. Each wheel in turn is raised by a jack and lowered so that it rests on the two fluted rollers of the machine. These rollers are rotated by turning the handle of the machine, and with them the wheel of the car rotates against a specially designed cutting knife.

The cutter consists of a hollow V-shaped blade mounted in an adjustable holder. The blade is pressed into the rubber by screw action to the desired depth and remains rigid while the wheel is rotated, thus making a V-shaped groove. The knife will not cut the canvas inside the tyre, so that the inner tube cannot be damaged even if the knife is not properly adjusted. As many parallel grooves as required can be cut in a few minutes.

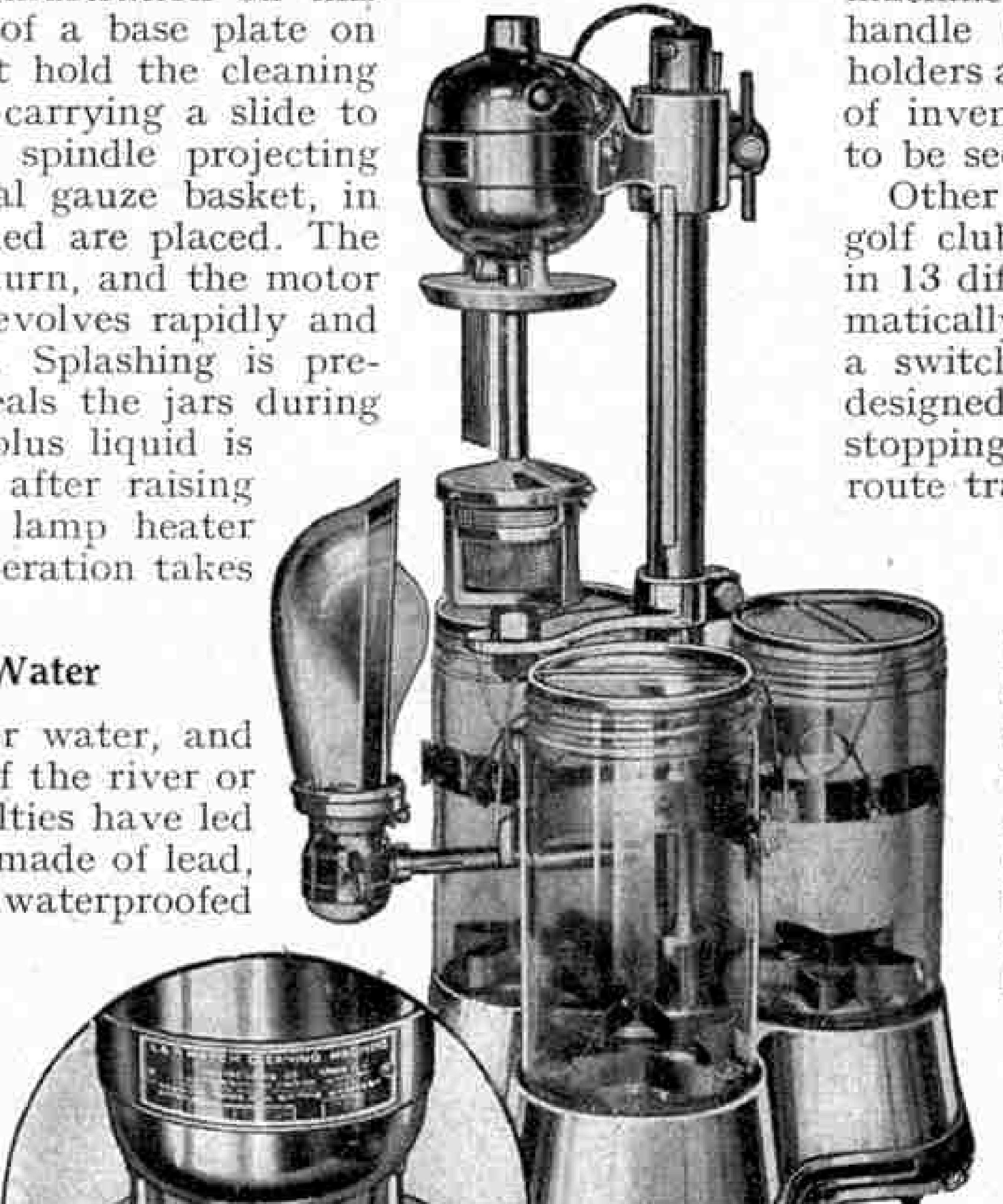


A tyre grooving machine. Photograph by courtesy of Harvey Frost and Co. Ltd., Bishops Stortford.

Machine that Cleans Watches

Watches must be cleaned periodically in order to remove the dust and dirt that gradually accumulates in their works. This usually is done by hand, and the process is laborious and requires great skill. A machine has now been introduced to do the work, however, and it is claimed that the new process is not only quicker, but also gives better results and involves less risk of damage.

The apparatus, which is shown in the illustration on this page, is electrically operated. It consists of a base plate on which are mounted the three vessels that hold the cleaning liquids. In the centre is a metal column carrying a slide to which an electric motor is attached. A spindle projecting downward from the motor carries a metal gauze basket, in which the parts of the watch to be cleaned are placed. The basket is lowered into each of the jars in turn, and the motor is then switched on, so that the basket revolves rapidly and the watch parts are thoroughly treated. Splashing is prevented by means of a rubber cap that seals the jars during the cleaning process, and afterwards surplus liquid is removed by rapidly rotating the basket after raising it. Finally the basket is rotated over a lamp heater until the parts are thoroughly dry. The operation takes less than four minutes.



Watch cleaning has been made a simple matter by the device illustrated above. Photograph by courtesy of Anglo-American Products Ltd., London.

A Flexible Pipe for Laying Under Water

It is often necessary to lay pipes under water, and difficulties are apt to arise when the bed of the river or harbour concerned is uneven. These difficulties have led to the invention of a flexible pipe. This is made of lead, protected by layers of paper and jute, and waterproofed with asphalt. The whole is covered with steel wire, and can be used for gas, oil or water.

The new flexible pipe is coiled on a drum so that it can be laid from a barge in the same manner as an electric cable. The process of laying also is novel and interesting, for the pipe is put down in a curved trough, in which are jets supplied with water at high pressure. The trough is drawn along the bed on which the pipe is to be laid, and the action of the jets causes it to work its way into the mud or sand, carrying the pipe with it. Thus the latter is left in a trench in which it is subsequently covered by silt, giving additional protection against damage.

Simple Tests for Car Brakes

A simple device, known as the decelometer, has recently been introduced in America for testing the efficiency of motor car brakes. In appearance it resembles a flashlamp, with two small round windows in the side, one red and the other green, and for a test is simply placed in position facing the driver. Inside it is a small quantity of mercury, which moves forward in a groove when the car under test is pulled up by braking, thus making one of two electric contacts that illuminate the windows. If the brakes are efficient and the car is pulled up sharply, the mercury moves forward far enough to light the green signal, but the red light glows if the brakes are not sufficiently effective. The indicators are said to be very accurate and reliable.

Yorkshire Inventions Exhibitions

The Exhibitions organised in London and Newcastle by the Institute of Patentees have done valuable work in encouraging British inventors. Last year the Institute extended its activities to other provincial centres, similar Exhibitions being arranged in Sheffield and Leeds respectively during October and November 1937. As usual at such displays, the inventions exhibited ranged from large mechanisms for industrial use to ingenious appliances and gadgets for use in the home. Among them was a dust and smoke meter, invented by Dr. Blacktin, Leeds, to which a Silver Medal was awarded. Before the smoke problem in our great cities can be tackled some accurate means of measuring impurities of this kind are necessary. Dr. Blacktin's meter actually arranges the microscopic particles in air or gases for weighing and individual counting, and samples also can be compared visually.

Another contrivance that also was awarded a Silver Medal was an anti-dazzle fitting for motor car headlamps. This was exhibited by two Rotherham inventors. It is made of plastic material and eliminates all the dazzle rays when placed over the head lamps of a car. Domestic devices for which similar awards were made were a knife sharpener and what is described as a superhet working machine. Even such ordinary things as bicycle handle bars, lampholders, carpet sweepers, map holders and dart boards do not escape the attentions of inventors, and improved forms of these were to be seen at the Exhibitions.

Other interesting devices on view included a golf club with an adjustable face that can be set in 13 different positions, a cigarette case that automatically releases and lights a cigarette when a switch is pressed, and an indicator for buses designed to display to passengers the names of the stopping places and the centres of interest on the route traversed by the vehicle.

An Electro-Magnetic Fretsaw

An ingenious electro-magnetic fretsaw has been produced by a German electrical engineering firm. It consists of an electro-magnet fixed beneath a steel diaphragm, to which the blade of the fretsaw is clamped. Alternating current is passed through the coil of the magnet, which therefore can be connected to the ordinary lighting mains, and the resulting alternating magnetic field attracts and repels the diaphragm, causing it to move rapidly up and down. The saw moves in unison, the length of its stroke being adjustable between 2 mm. and 7 mm., or roughly 1/12 in. and a little more than ¼ in.

The saw can be used to cut plywood to a thickness of 18 mm., or .7 in., and soft wood to 50 mm., or almost 2 in. One great advantage it possesses is that its user's hands are free to manipulate the work as required.

Stiff Collar that Requires No Starch

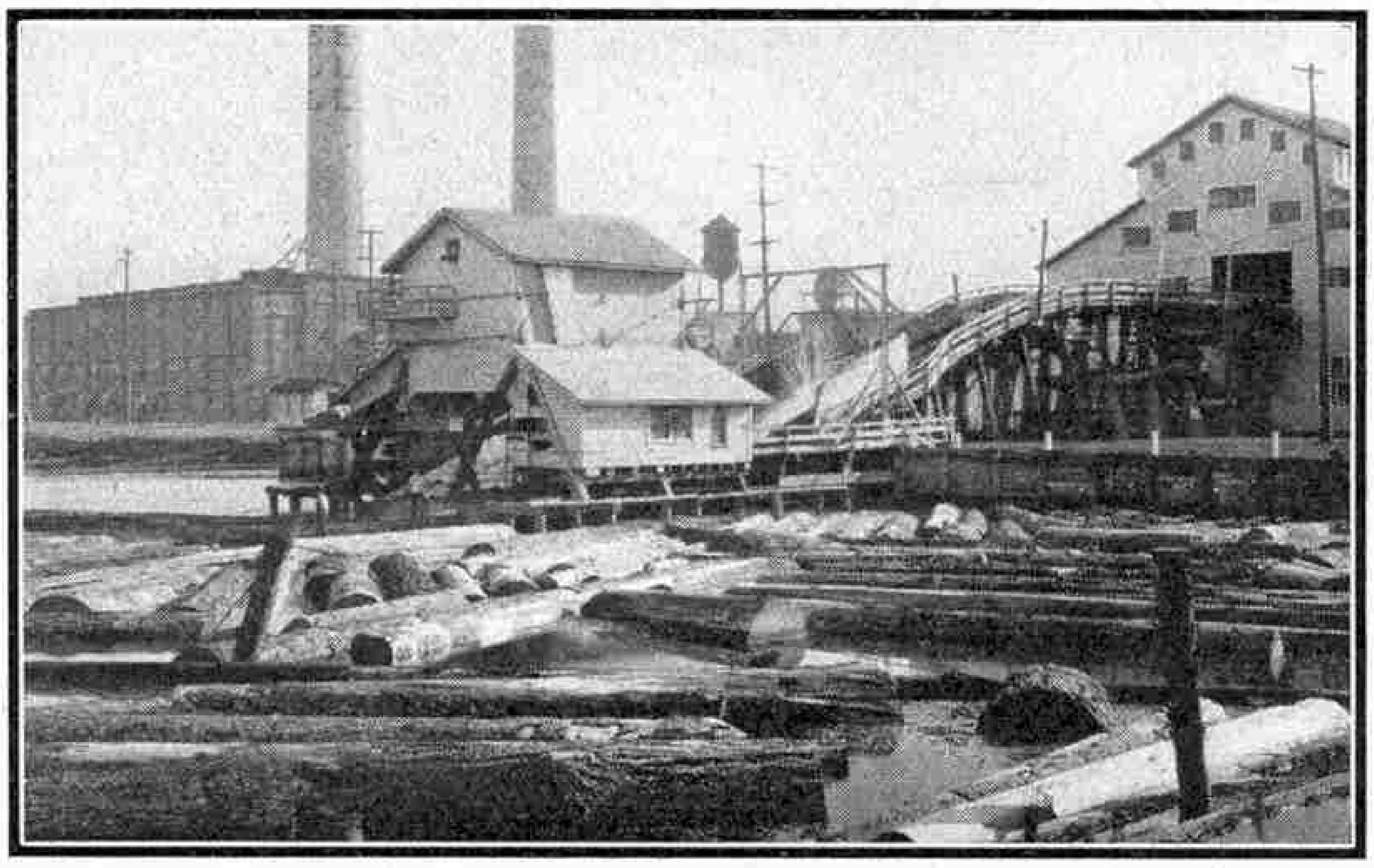
A stiff collar that requires no starching and has the necessary porosity for comfort has been produced by an American scientist. It is composed of three layers of material and every third thread in the weft of the lining is of cellulose acetate which becomes adhesive when treated with acetone. The layers are joined by pressing while warm. Another invention reported from America will be of particular interest to housewives. It is an automatic washing machine which will soak, scrub, rinse and dry the garments supplied to it. When the work is completed it ceases operation immediately.

From Log to Lumber

Compressed Air Machinery in a Sawmill

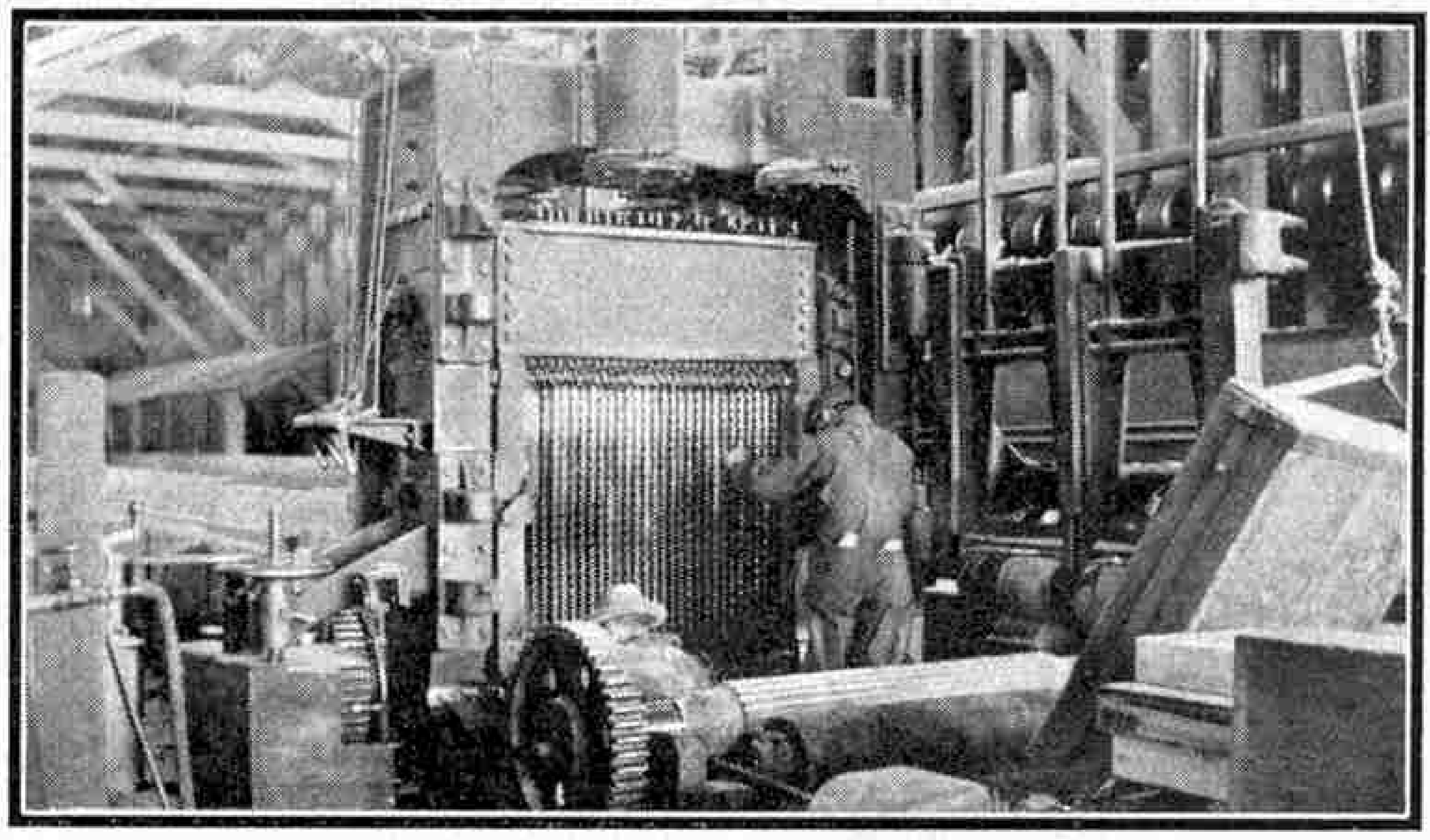
FEW works operations are more fascinating to watch than those carried on in an up-to-date sawmill in which giant logs are reduced to lumber. The weights handled are not so great as those dealt with in steel works, but the movements are much swifter, logs weighing over 20 tons being rolled and flicked about as quickly as the men in charge can manipulate the controlling levers and foot pedal.

An attractive plant of this kind, the largest lumber mill in the world, is that of the Long-Bell Lumber Company at Longview, on the banks of the Columbia River, in the United States. It is 50 miles from the Pacific Ocean, but at that point the Columbia is deep and wide and the docks at the mill can accommodate large ocean-going vessels. The plant is as nearly as possible automatic throughout, and the two units of which it consists are remarkably efficient in their task of converting fir, hemlock and cedar logs into timbers and finished lumber, and even into such manufactured products as window frames and furniture. Altogether there are six head rigs, where the giant logs are sawn up, and if the daily output for two shifts of 8 hrs. each were reduced to 1 in. boards a foot wide it would stretch over a distance of 25 miles.



The pond at the Longview lumber mill, in the United States, into which logs are dumped ready to be hauled into the mill. For the illustrations to this article we are indebted to the courtesy of Mr. H. W. Young, Portland, Oregon, and the "Compressed Air Magazine."

Steam was once the only motive power used in sawmills, but in the Longview plant all the heavy lifting, pushing, turning and squeezing is done by compressed air. The installation has a capacity of 9,200 cu. ft. of air per minute, and this is distributed throughout the plant by means of a maze of pipes, varying from 10 in. leads from the main receiver to ½ in. service lines that deliver it exactly where it is wanted. The greatest distance over which it is transmitted is 2,700 ft. Steam could only be passed through pipes of similar length, branching out all over the plant, with enormous loss of heat unless an elaborate and costly insulating system were installed.



A workman rearranging the vertical blades of a gang saw that is used to reduce the logs to small section lumber. Some gang saws have 37 blades in them.

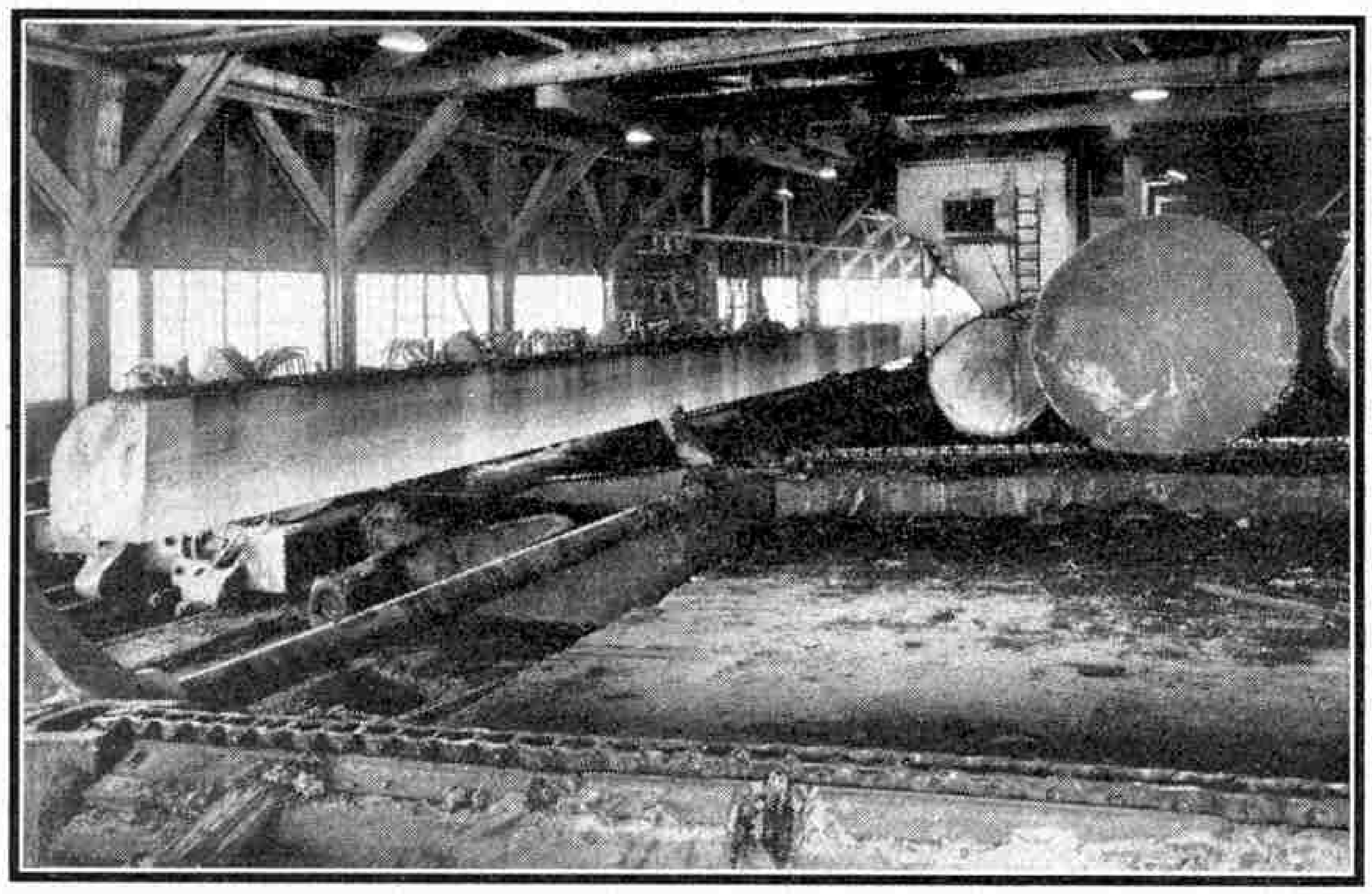
The logs handled in the mill are hauled from the forests and dumped into a huge pond or basin more than 1½ miles long. They are hauled by a tug to the end at which the mill is situated, and there are seized by a chain conveyor, which hauls them up an incline leading to the second storey. On their way they pass through high pressure water jets, which wash off dirt and sand.

The logs now are rolled on to a sloping deck, where several of them can lie side by side, held in position by loader arms. They are released one at a time, and each in turn rolls down to the immense carriage on which they are taken past the huge band saw that slices them up. The carriage is 50 ft. long, but logs of even greater length than this can be dealt with by the addition of a trailer.

The log is pushed on to the carriage by massive arms operated by compressed air. If the sawyer does not think that it is in a good position he moves a lever, and hooks then reach up between the arms and turn it over. If it is still not lying satisfactorily, he presses a foot lever, which brings into play a vertical arm called a "nigger." The head of this has toothed sides. It can butt the log in the middle and throw it straight up, or its toothed sides can be made to catch the log and roll it over.

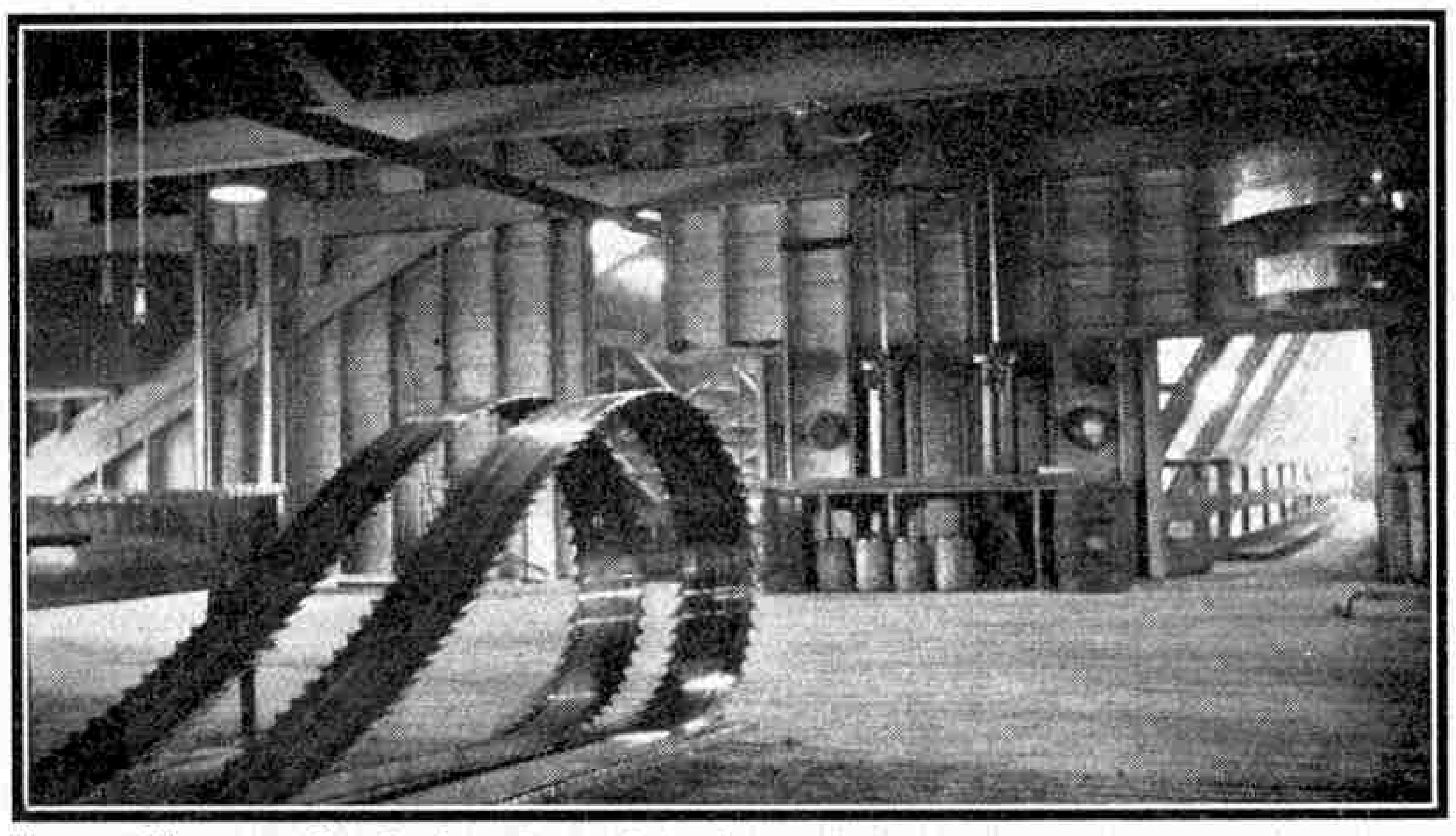
On the carriage the log lies against vertical "knees," with one side projecting slightly over the side of the carriage. In this position it is firmly secured by steel teeth and hooks, controlled by the block setter, who rides on the carriage while work is in progress, sitting in the midst of an octopus-like snarl of compressed air pipes leading to the working parts of the carriage. The sawyer and the block setter work together as a team. Every movement has to be made in correct order, and to be exactly timed, in order to avoid catastrophe at the head rig, and the two men can only co-operate with the necessary speed after considerable practice together. Their signals to each other are almost imperceptible to an outsider, but they recognise them easily and each responds almost unconsciously to the other's demands.

When all is ready the carriage moves forward towards the giant vertical band saw, which cuts off a "cant" or slab, sometimes known as a "flitch," of the required thickness. The carriage is then reversed and the knees are pushed forward the requisite amount to project the log again over the side of the carriage, so that another cant can be cut off. When the log has been given a square face throughout its whole length, it is turned over on its flat side by means of the hooks operating it, and then is either squared up on all sides, to form what is called a "timber," or is converted rapidly into cants.



Logs held in position on a sloping platform in readiness to be rolled on to the saw carriage. This carriage bearing a partly-sawed log is seen on the left of the illustration.

As the cants come from the saw they are 4 in. to 12 in. in thickness, and both these and the squared timbers fall on to a long row of rollers called the "live rollers" or "roll case." These lead out from the head rig across the building and out to the timber dock, several hundred yards away, and the cants and timbers can take several courses along them, moving forward or sideways according to the treatment required. If a cant has rough bark edges and needs squaring up, its progress is checked by a "bumper," which is heaved up between the rollers at the proper point. Travelling chains moving at right angles to the line of rollers are then hoisted up at one end in order to lift the cant and move it sideways to position in front of the "bull edger," a machine that rapidly saws the edges square. The squared-up cant moves forward to another line of rollers parallel with the main roll case. It may be suitable for cutting into boards, say 2 in. thick. More chains then transfer it again to the right, where it is seized by rollers that thrust it against a gang saw with up to 37 vertical blades, spaced 2 in. apart.



The saw-filing room directly above the head rig of the mill. The saws travel at the rate of 120 m.p.h. when at work and have to be re-sharpened three times daily.

The gang saw rapidly cuts up the cant to the desired size except as to length, for which trimmer saws are used. There are 24 of these, all in a row and spaced equal distances apart, and each can be lowered separately to cut its way through a board passed under it. The trimmer in charge of the saws sits in a little cabin looking down upon the lumber passing along the rollers. In front of him is a row of tiny levers, each corresponding to one of the saws. He scans each piece of wood and plays upon his levers, operating saws here and there along the line in order to reduce the boards to various standard lengths, cutting them up to the best advantage. Certain timbers have only their ends cut off. Others are divided into two or three pieces, and knotty or shaded parts here and there are taken out altogether. The trimmer has to decide almost instantly what to do with each board, and to give effect to his decision without delay by means of his finger play upon the levers.

As the cants and timbers make their way down the case roller, the system seemingly becomes more and more complicated. Men who know the lumber business thoroughly turn the streams here and there, however, selecting and separating until all the lumber is collected into two lines leaving the mill. One of these lines leads to the docks, where the lumber is shipped; the other passes on to kilns in which the wood is dried in readiness for making it up into the manufactured products of the firm.

At intervals the great saws that slice off the cants have to be removed for sharpening and setting. This is not surprising, for a saw travels two miles during every minute it is in action and in its average working life covers more than 100,000 miles. The change is made three times a day, and the sharpening is carried on in a room above the head rig. This room is still spoken of as the saw-filing room, and the operation described as filing, although for many years the work has been done by automatic grinding wheels instead of files.

The instant a saw is pulled from the wheels it is sent up to the filing-room in a lift. There it is seized by two men waiting for it, who carry it across the room to the filing rig. A sharpened saw is then rushed back to the hoist so that work at the head rig can be recommenced without costly delay, the change taking only about half a minute. The saw to be sharpened is put on a rig in a horizontal position, with its teeth upward, and is made to revolve slowly. As each tooth passes under the grinding wheel, the latter makes one pass, down and up, giving it the sharpness of a razor.

For the information in this article we are indebted to the courtesy of the "*Compressed Air Magazine.*"

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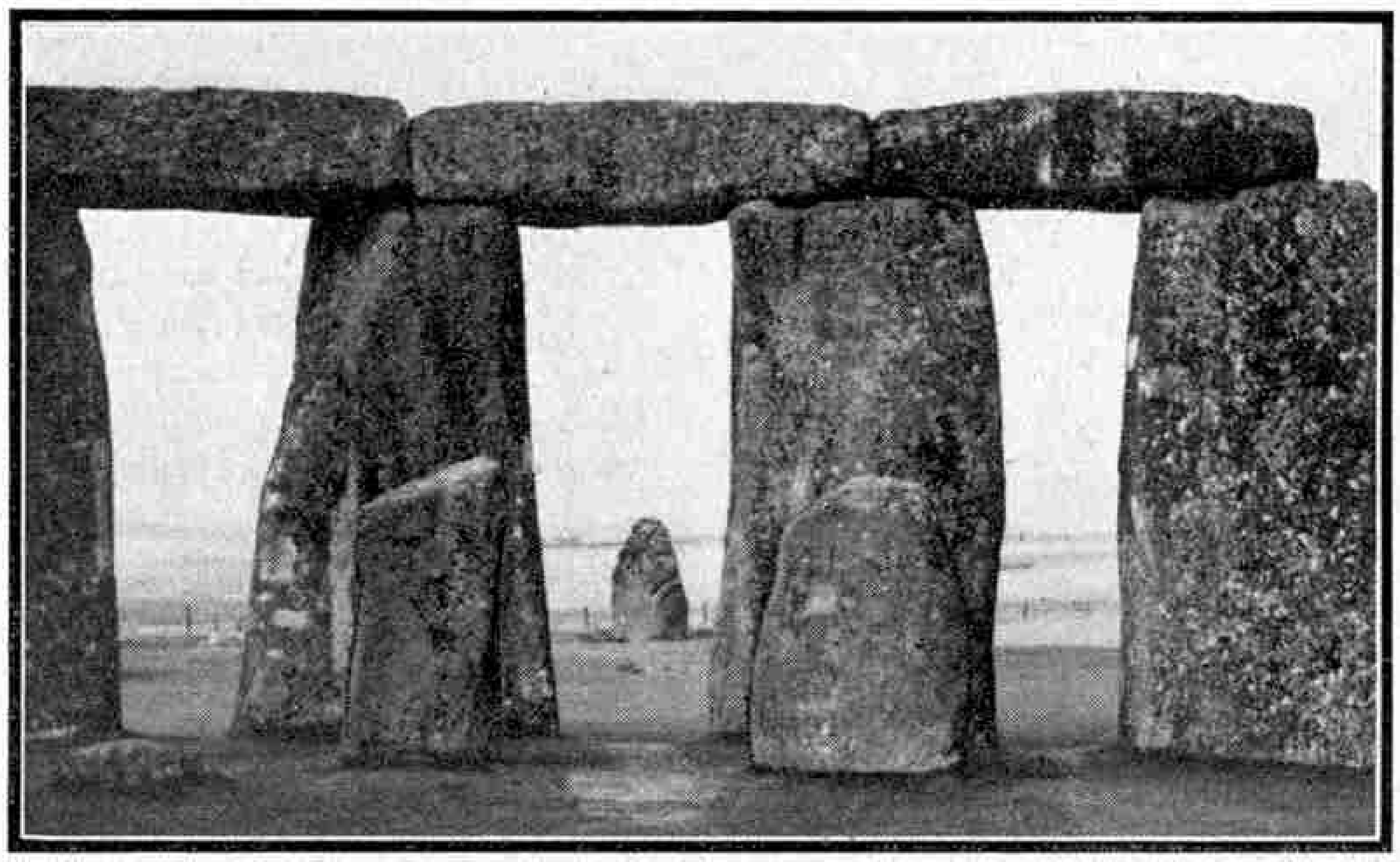
These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

A Visit to Stonehenge

I approached Stonehenge from Amesbury, and as I crossed the plain I was struck by the apparent smallness of the monument, probably the most famous in this country. Its giant grey boulders were brought there about 2,000 years B.C. by Neolithic or New Stone Age men.

Stonehenge comprises several concentric groups of boulders, surrounded by an earthwork some 300 ft. in diameter. The formation has suffered with time, but sufficient evidence has been found to make the original grouping clear. A circle of more than 30 stones from local quarries stood upright inside the earthwork. Across the tops of these stones were placed "lintels" to form a continuous line round the circle. These lintels were dovetailed into one another for stability, and in addition were fastened to their uprights by mortise and tenon joints, the tenons being on the uprights, as can be seen to-day on fallen stones.

Inside this circle were 30 other upright stones, which have been identified as from the Prescelly range in Pembrokeshire, 150 miles away. The next of the concentric groups of stones was of horse-shoe shape, and included five sets of three stones, each set comprising two uprights and a lintel. Finally came an inner horse-shoe of 15 upright stones. There was a large flat stone in the bend of the horse-shoe, and this was the altar stone.



A view from the altar stone at Stonehenge, showing the Hele Stone in the distance. This famous monument was erected about 2,000 years B.C. Photograph by J. Jones, Prescot.

The two inner groups open to the north-east. I stood on the altar stone, and looked in this direction down an avenue towards a large upright stone about 16 ft. high. This is the famous Hele Stone, behind which the Sun rises on the longest day of the year, and more than anything else it marks Stonehenge as a planned monument, almost certainly of religious origin. A photograph I took from the altar stone is reproduced on this page.

Numerous finds at Stonehenge show something of the way in which the stones were quarried and erected. They seem to have been trimmed with heavy mauls weighing up to 60 lb., and wielded by two or three men. The finer work probably was done with flint hammers and axes, many of which have been found in the vicinity. The ground at Stonehenge is soft and chalky, and was excavated with picks and rakes made of deer antlers. The stones from Pembrokeshire must have been hauled by means of hide ropes.

There are about 300 barrows, or graves, in the vicinity of Stonehenge, and the excavation of some of these has revealed cremated human remains, hand-made pottery, flint implements and ornaments of gold and amber. These discoveries have thrown interesting light on the trade that existed in prehistoric times between Great Britain and the Baltic countries, the great source of amber. J. JONES (Prescot).

The "*Viking*"

While at Sharpness, on the River Severn, last July I watched the docking of the four-masted barque "*Viking*," which had just completed a 103-day passage from Australia with a cargo of 4,000 tons of wheat. She was the first sailing vessel to visit the port since 1921, and her striking appearance and beautiful lines attracted much attention among Sharpness seafarers. She belongs to Captain Gustaf Erikson, and is one of his fleet of grain ships employed in the Australian trade. In 1932 she sailed from Copenhagen to Port Lincoln, South Australia, in 84 days.

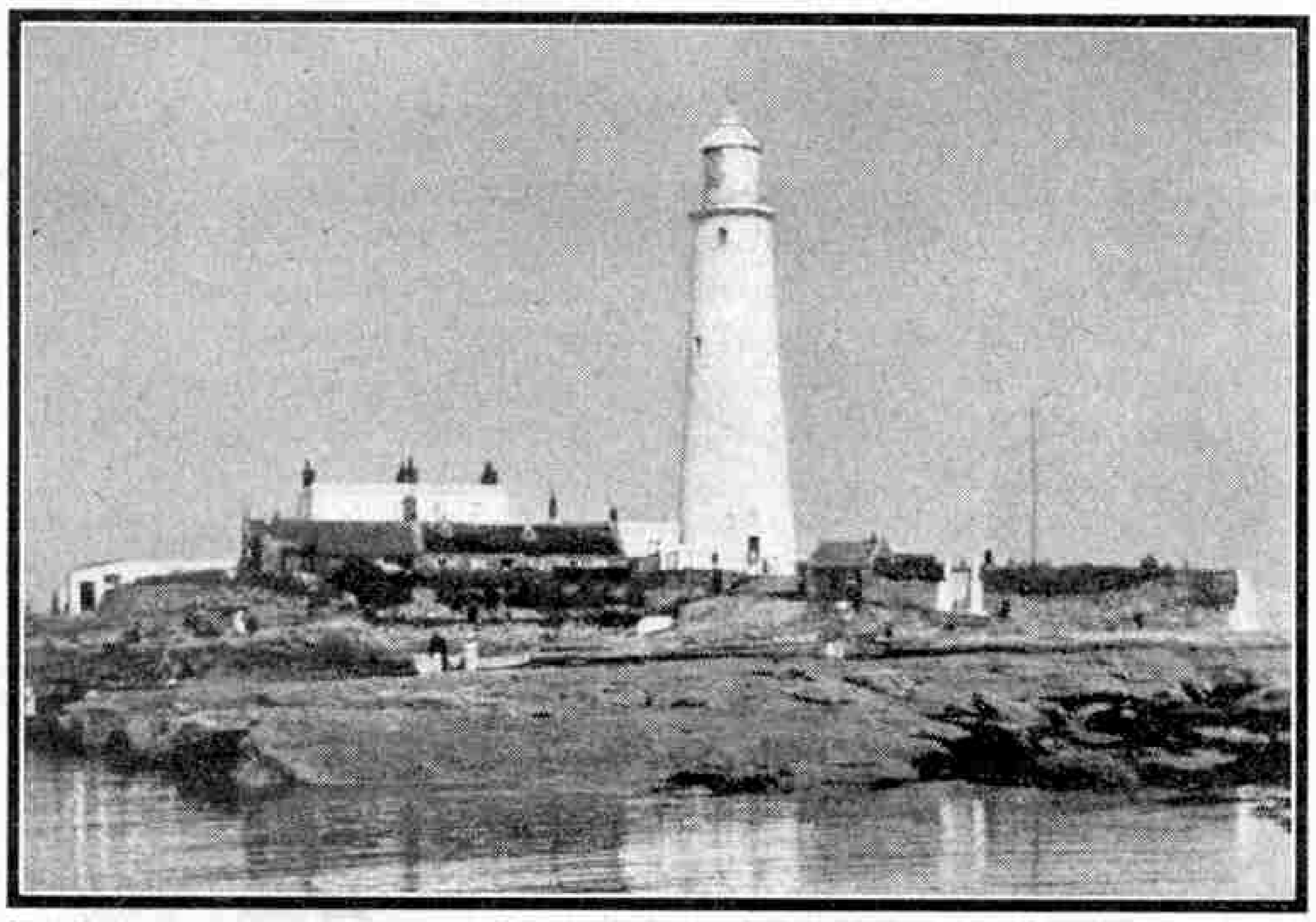
The "*Viking*" was built in Denmark in 1907, and is of 2,952 tons, with a length of 293 ft. 8 in. She acted as a Danish sea-going training ship until about 1929, when she was bought by Captain Erikson. A crew of 27 are carried, most of whom are Finns. They speak English well, and I learnt from the second mate that the vessel is fitted with wireless, has all-steel masts, and carries more than 20 sails. These are hoisted by steam winches, wire rigging being used instead of the usual rope.

There are two steering wheels on the ship, one at the stern, and the other forward. The stern wheel is for emergency use in the event of the steering cables breaking. The interior of the ship is painted a sea-green colour, and is very neat and comfortable.

The "*Viking*" remained in dry dock at Sharpness for nearly three weeks, during which time she was repainted white. She then sailed for her home port in Finland. K. L. DUTTON (Gloucester).

A Unique East Coast Lighthouse

The lighthouse on St. Mary's Island, at the north of Whitley Bay, Northumberland, is a relatively modern structure, erected in 1898, but the mechanism of its light, although efficient, is far from up to date. At sunset the lighthouse keeper fills a measure with methylated spirit, and pours it into a little pan. This he places under a burner in the centre of the glass structure of the lantern. He then sets fire to the liquid, and leaves it to heat the pipes in which oil is pumped by hand from tanks in a chamber below. The process takes some 15 minutes, and the keeper employs that time in removing from the lantern walls the long buff-coloured curtains that by day keep the Sun's rays from the prismatic glass. But for these curtains the thick glass of the lamp would act like a huge "burning-glass," and cause unbearable heat in the chamber.



The lighthouse on St. Mary's Island, off the coast of Northumberland, which was built nearly 40 years ago. Photograph by J. G. Peirson, Whitley Bay.

By the end of the 15 minutes the Tyne lighthouses to the south have commenced flashing their warning signal. The keeper now lights the burner, which makes the mantle incandescent, and sets the framework of dazzling glass rotating slowly, the light being concentrated in two double bullseyes. This framework weighs two tons and is supported on mercury to reduce friction to a minimum.

Each of the panes of convex glass in the lantern case is of diamond shape, measuring 4½ ft. by 2½ ft. and having a thickness of ½ in. The lenses are rotated by a clockwork mechanism using weights, and based on the principle of the grandfather clock. The keeper on duty has to wind this up every hour. A bell attached to the metal case holding the weights rings to give warning when the mechanism is fully wound, and also when re-winding is necessary.

In a little room below the lantern are the oil tanks, a cupboard containing tools and charts, a small table, and a telephone. The room is lit by a small oil-lamp. There are 137 steps leading up inside of the lighthouse to the lantern.

J. G. Peirson (Whitley Bay).

The Village of Giethoorn

The village of Giethoorn, in Holland, is often called the "Venice of the North," for it has canals instead of streets. While on a visit there, my friends and I hired a punt, which was propelled by a pole much shorter than the usual type, for the canals are not deep. In this we set out to see what the village looked like.

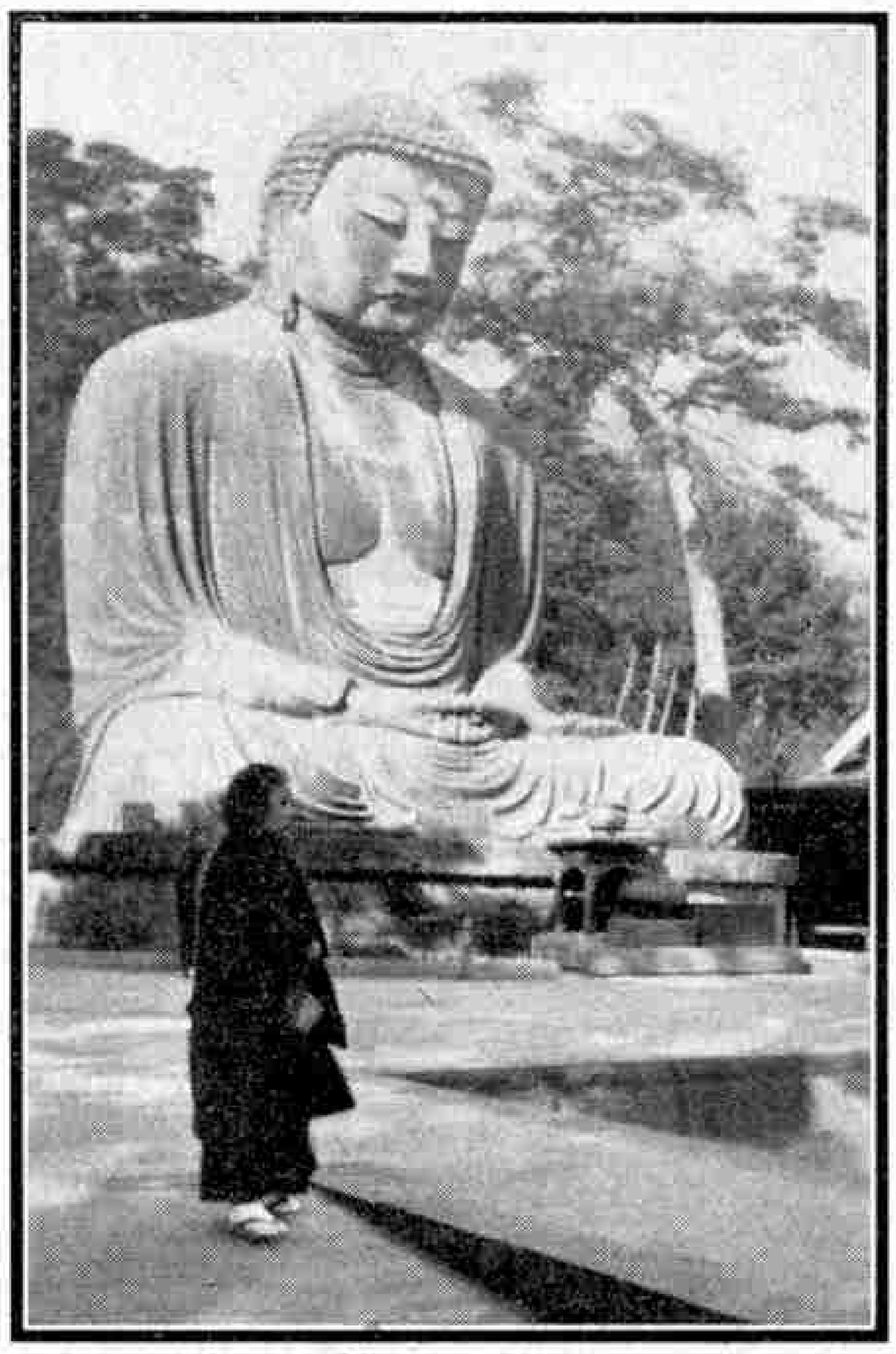
We greatly enjoyed this novel method of transport. There are few shops on the banks of the canals, for shopkeepers find it more profitable to carry their wares in punts from door to door. This gives rise to some curious sights. Turning a bend we came upon a man with a large punt full of cows. At every doorstep he stopped and milked one of the cows for a customer. We next met a man selling fruit, so drew alongside and bought some.

There are signposts to show one the way, some standing on the bank and others sticking out of the water. As we sailed slowly along we passed under many quaint little bridges. Most of these appeared safe, and no doubt all are, but I felt doubtful about venturing on to some of the older ones.

R. P. Letcher
(Ringwood).

The Daibutsu of Kamakura

Recently I went to see the famous Daibutsu, or Great Buddha, at Kamakura, about 90 minutes journey by train from Tokyo. This Daibutsu, shown in the lower illustration on this page, was erected in 1252, in a building 50 yds. square that later was carried away by a tidal wave. It now stands in a small park, which is entered through an exquisitely carved gate. Walking down the main path I gradually approached the massive image, and was much impressed by its dignity and majesty as seen against the bright blue sky.



An immense image of Buddha at Kamakura, known as a Daibutsu. Photograph by K. P. Matsuyama, Tokyo.

In the figure Buddha has been fashioned sitting cross-legged, with hands clasped, and the face bears a gentle and serene expression of deep meditation. The head is inclined forward, as the photograph shows, and this is said to have been caused by the great earthquake of 1923.

The image rests on a concrete base. It is 50 ft. high and 98 ft. in circumference, and has eyes 4 ft. in width, made of solid gold. Huge as this figure may seem, it is the smallest of Japan's three famous Daibutsus, the others being at Nara and Kyoto.

The interior can be inspected from a staircase running up the inside. I was interested to see a notice in English requesting visitors to conduct themselves with a dignity and solemnity that is in keeping with their surroundings.

The Daibutsu at Nara is of bronze. Its height is 53 ft. 6 in. and its weight 440 tons, and it dates back to the 7th century. It is housed in the largest shrine at Nara, which is about 40 miles from Kyoto and is remarkable for its many ancient structures of this kind. These are in a beautiful park in which are about 800 sacred deer that are tame and wander about freely.

K. P. Matsuyama (Tokyo).

Lineside Signs of the L.M.S.

Summit and Tunnel Indications

On page 716 and 717 of the "*M.M.*" for December last we described the lineside signs that have recently been erected at various points on the East Coast Route of the L.N.E.R., such as county boundaries and the Border between England and Scotland. We referred also to such lineside memorials as the monument to Colonel Gardiner near Prestonpans, and to the inscription on the house once occupied by George Stephenson at Killingworth. This month we deal with similar signs that are to be seen on various routes of the L.M.S.

There is no practice that is standard throughout the L.M.S. system with regard to lineside signs of a descriptive nature. There are however numerous signs of this kind, from which travellers can obtain information of great interest. Thus on the lines of the former Midland Railway, and on certain other sections of the L.M.S., it has long been the practice to indicate the name and length of each important tunnel by means of notice boards at each entrance. These boards add considerably to the interest of a journey. For instance, it is thrilling to catch sight of a board lettered "*Totley Tunnel 6230 yards*" before the train is swallowed up in sulphurous gloom, and to realise that we are passing through the second longest tunnel in the country. This is more exciting for passengers who are not familiar with the route on which they are travelling than merely wondering which tunnel they are entering, and how long it will be before they are out of it. Incidentally each mouth of this particular tunnel also is inscribed with its name and the date of completion, 1893.

The notice board at Slochd Summit on the Highland Section of the L.M.S. Boards of this kind giving the altitude of the line are also placed at Druimuachdar and Dava Moor. Photograph by D. S. Barrie.

Summit levels are other points on the L.M.S. that are indicated by special signs. Here again the Midland Division provides a notable example. At Ais Gill 1,167 ft. above sea level, a board marks the summit of that bold engineering undertaking, the Settle and Carlisle line, on the route of which it was once said that there was not a flat space anywhere of sufficient area to build a house.

The principal summits also are indicated on the Highland Section main line of the L.M.S. There is Druimuachdar, 1,484 ft. above sea level and the highest point reached by a main line in Great Britain. Another "peak" at Slochd Mhuic, 1,315 ft. above sea level, is indicated by the neat board shown in the accompanying illustration. Each of these are on the main line that runs between Perth and Inverness via Carr Bridge. The alternative and older route, via Forres, crosses bleak Dava Moor, the summit being 1,052 ft. above sea level. Dava was a name of ill-omen in former times, for it had a special reputation for snow blocks. The possession of the newer route however and the adoption of special measures for combating the snow have taken away much of the terror formerly inspired by the name.

Altitudes are of special interest on this mountainous system and it has long been Highland practice to indicate the height of each station above sea level. This height is shown under the name on the station nameboard.

Just as on the L.N.E.R. there is a military memorial in the shape of the monument to Colonel Gardiner, who fell at the battle of Prestonpans in the Jacobite rising of 1745, so on the L.M.S. route between Crewe and Shrewsbury is an obelisk erected to the memory of Field Marshal Viscount Combermere, one of Wellington's generals. This was described in the "*L.M.S. Magazine*" some time ago, and the following details are taken from this account.

The Combermere obelisk is about half way between Wrenbury and Whitchurch stations. It is about half a mile from the railway, and was erected in 1890 at a cost of £2,000. There is an inside staircase by means of which it is possible to reach the windows to be seen half way up, and as the memorial stands on high ground a fine view of the Welsh hills and of the Cheshire plain is obtained on a clear day.

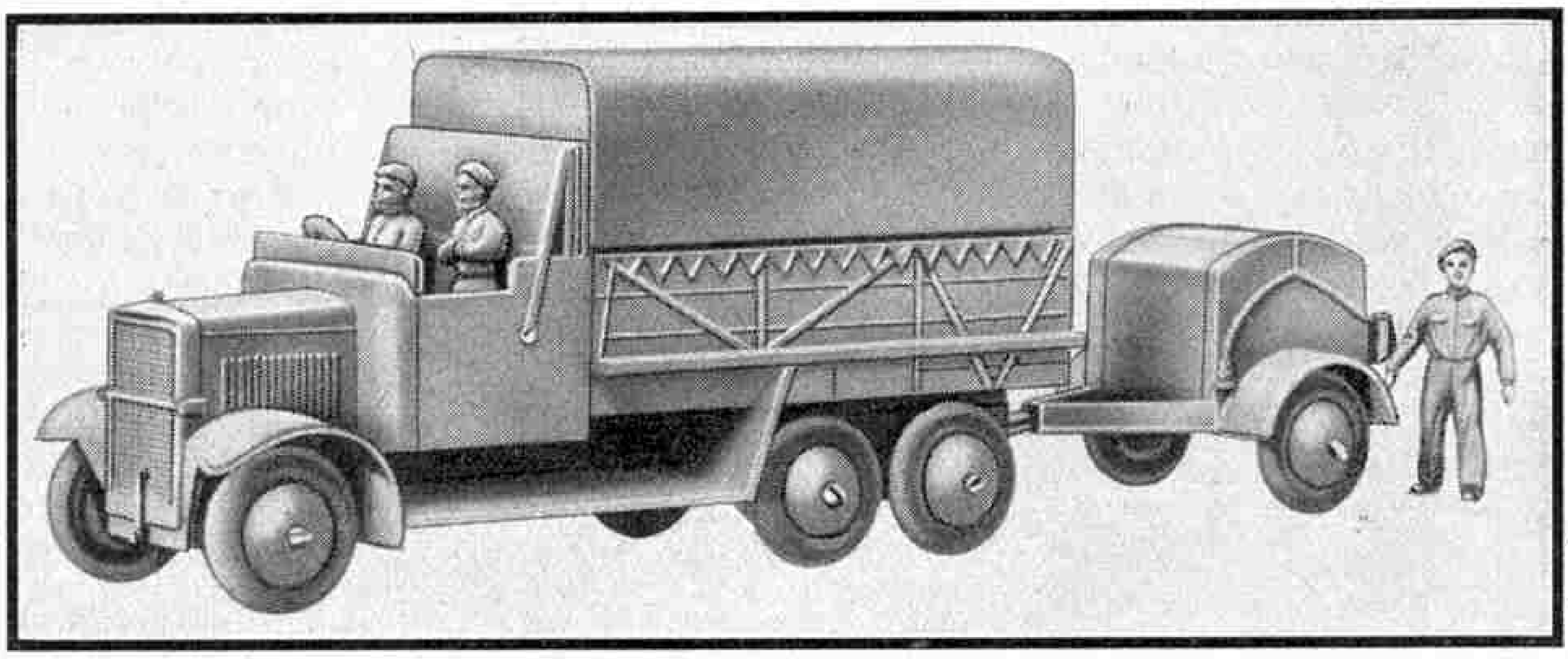
A point of railway interest is that when the Crewe to Shrewsbury line was built in the 'fifties, Viscount Combermere gave the Company the land for the horse-landing at Wrenbury station. In return he received the right to have any express train stopped at Wrenbury for his use upon making application to the station master, and handing him a card authorising him to stop the train!

An obelisk of quite another kind is that on the side of the main line of the L.M.S. on the former L.N.W.R. Section at the point where the system enters the County of Middlesex. It was erected in accordance with the provision of the London Coal and Wine Duties Act of 1861, as one of the "Boundary Stones' or Permanent marks on the point where any Canal, Inland Navigation, or Railway, or any Turnpike or Public Road, first enters or comes within the Metropolitan Police District." It is evidently an important sign!

A lineside memorial of somewhat melancholy interest recalls the first known railway fatality, the accident to Mr. Huskisson at the opening of the Liverpool and Manchester Railway. This is situated alongside the L.M.S. line near Newton-le-Willows.

The Royal Tank Corps

Reconnaissance Cars and Transport Equipment

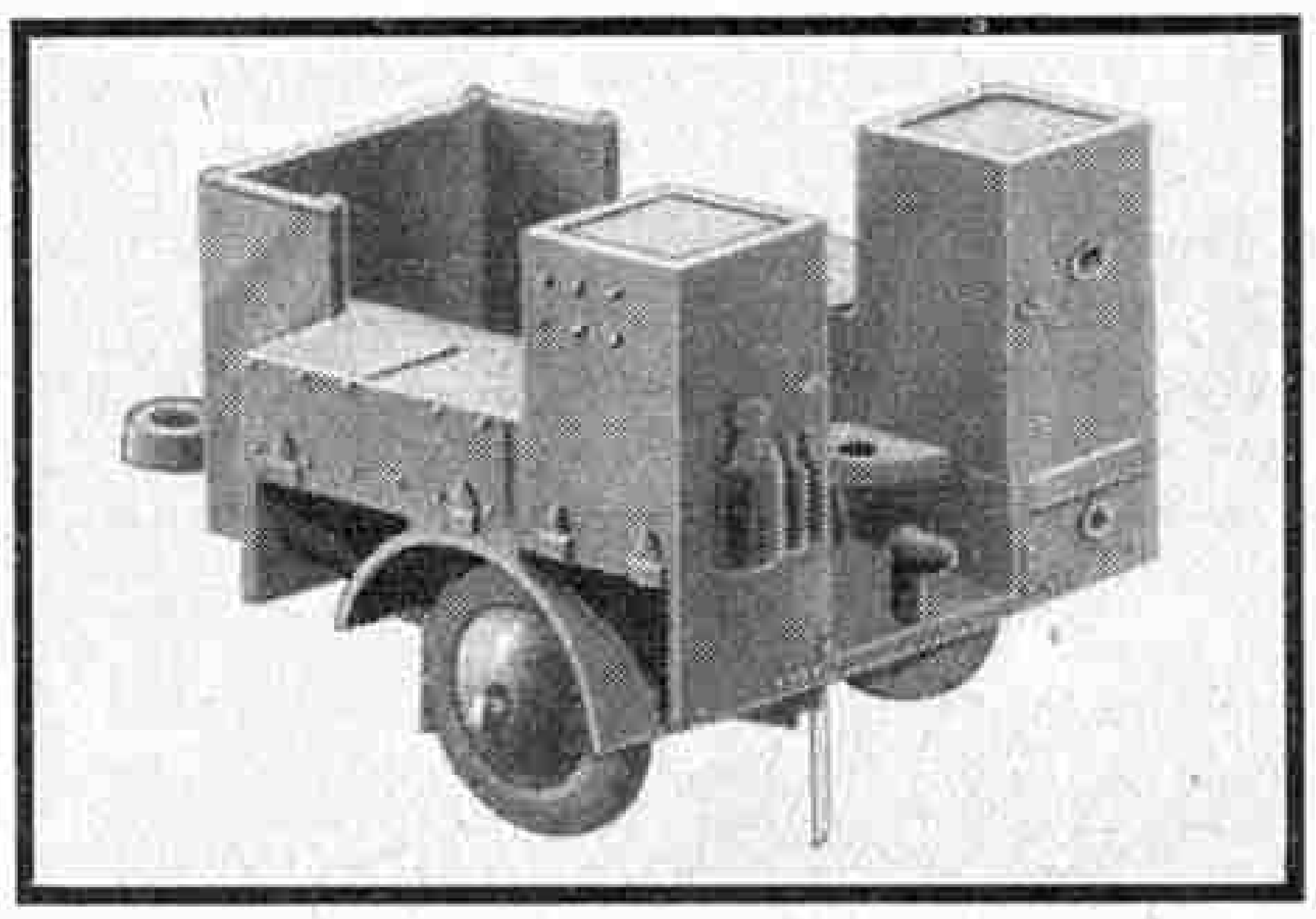


The Dinky Toys Transport Wagon, No. 151b, of the Royal Tank Corps Series, with a Water Tank Trailer, No. 151d.

IN the December 1937 *"M.M."* the Medium and Light Tanks of the Royal Tank Corps were described, along with their reproductions in the Dinky Toys Series. The Royal Tank Corps makes extensive use of other vehicles, which are required for reconnaissance work, transport and other purposes, and these are dealt with in the present article.

A Royal Tank Corps battalion is made up of three companies, each consisting of a Light Section and a Medium Section, with the Company Headquarters. At Company Headquarters there are a medium tank and two close support medium tanks. The Light Section has seven light tanks, and the Medium Section consists of five medium tanks. Finally there is a special Battalion Headquarters Section, consisting of a medium tank, a light tank and two close support tanks.

Each company has a 30-cwt. lorry or transport wagon, together with one reconnaissance car, popularly known in the service as the "Recce" car. The transport equipment at Battalion Headquarters is more elaborate. In addition to a reconnaissance car and a 30-cwt. lorry, it includes two 3-ton transport wagons and two Austin Sevens, with one four-seater Hillman open tourer car for the use of officers. There is also a petrol cooker trailer, a water cart, and eight motor cycles.



The Dinky Toys Cooker Trailer, No. 151c.

Splendid reproductions of these vehicles are included in the Dinky Toys Medium and Light Tank Sets, Nos. 151 and 152. The Medium Tank Set includes a 3-ton Transport Wagon, a Cooker Trailer and a Water Tank Trailer in addition to the Medium Tank described and illustrated in the *"M.M."* for December last. There is no standard make of lorry in the Tank Corps. Those employed are six-wheelers, and the Dinky Toys model incorporates their chief features.

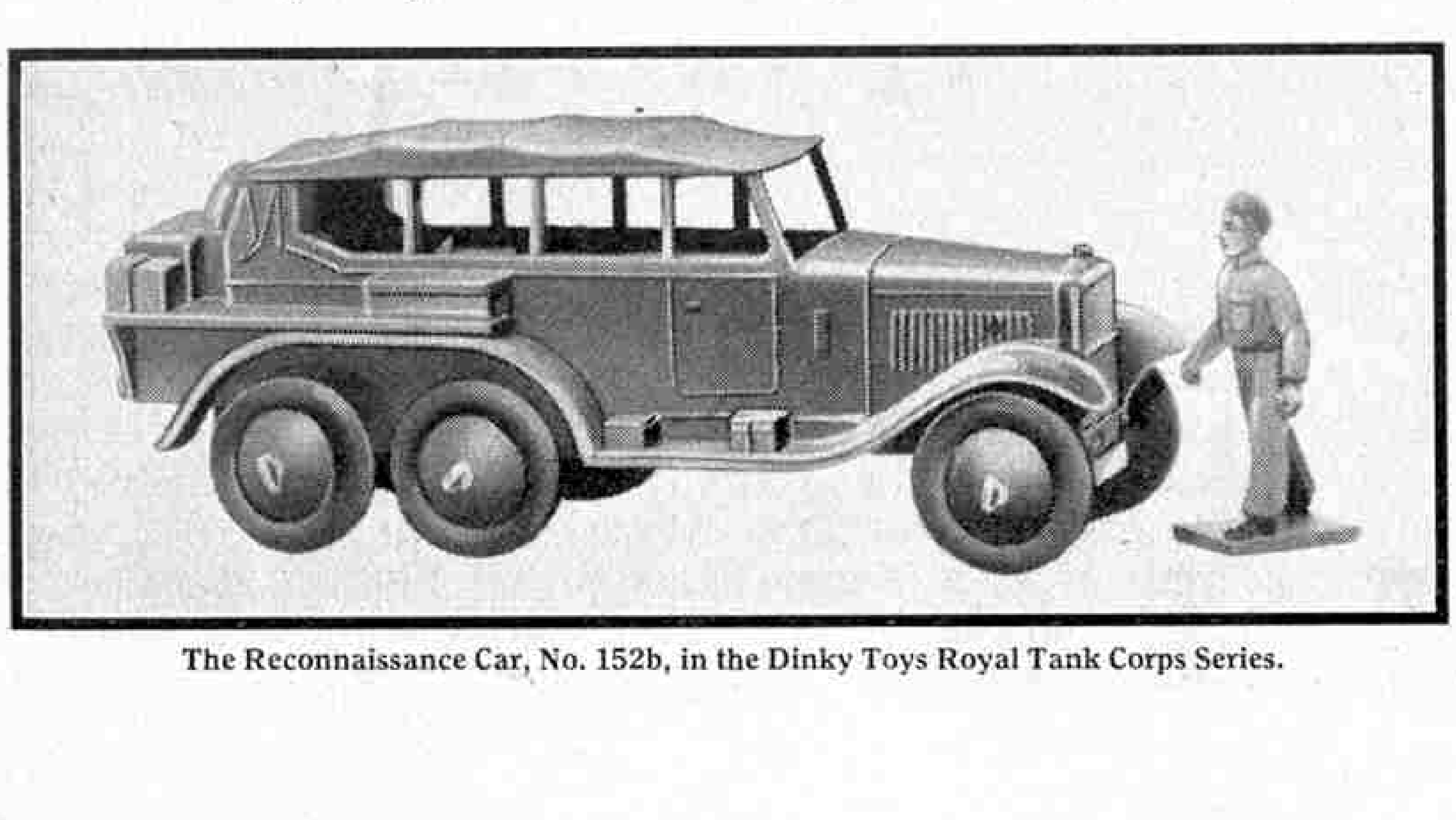
The Dinky Toys Cooker Trailer, No. 151c, is a particularly interesting vehicle representing the latest type of mobile kitchen, which is provided with a fire fed with petrol under pressure and is capable of doing the cooking for a whole battalion. It has two wheels, and can be coupled up behind the Transport Wagon. A jack is provided to enable it to stand up when in use, and at the back of the vehicle are representations of three fire extinguishers.

The water cart used by the Royal Tank Corps has a capacity of 300 gallons. It has a filter tank and a purification cylinder, with three taps, and is mounted on a two-wheeled trailer. All these features are well reproduced in the Dinky Toys model No. 151d.

The Dinky Toys Reconnaissance Car No. 152b, a six-wheeled open vehicle provided with a hood, is included in the Light Tank Set, in which there are miniatures of the Austin Sevens.

The fun that can be obtained with Dinky Toys Tank Sets, or with collections of the Tanks and other vehicles included in them, all of which can be obtained separately, is greatly increased when the miniature representations in the Series of the various ranks are used. How life-like and effective these are is shown in our illustrations. A Driver is included in each Tank Set, and Set No. 150 comprises six figures, including an Officer and other ranks, some of whom are shown sitting and others standing. All these figures are painted to represent the correct uniform. The men wear two-piece overalls with trousers strapped at the ankles, breast pockets, and a wide belt, and on their heads have black berets pulled down over the right side. The officers wear uniform similar to that of the Guards, but have black berets.

Every man in the Tank Corps is trained for all the tasks that have to be performed, so that owners of Dinky Toys Tank Sets need have no hesitation in transferring men to any position for which their attitude is suitable.



The Reconnaissance Car, No. 152b, in the Dinky Toys Royal Tank Corps Series.

In Search of New Models

Speed Boats and Motor Cruisers

COMPARATIVELY few model-builders appear to have realised what splendid subjects for model-building are provided by the many different types of motor racing boats. A great advantage of this kind of model-building is that the many different types of boats from which to choose make it an easy matter to select one that can be modelled realistically with the Meccano parts available. The most interesting types of course are the various kinds of racing craft, and these range from small boats driven by outboard motors to vessels such as *"Bluebird"* and *"Miss America,"* designed specially for record breaking.

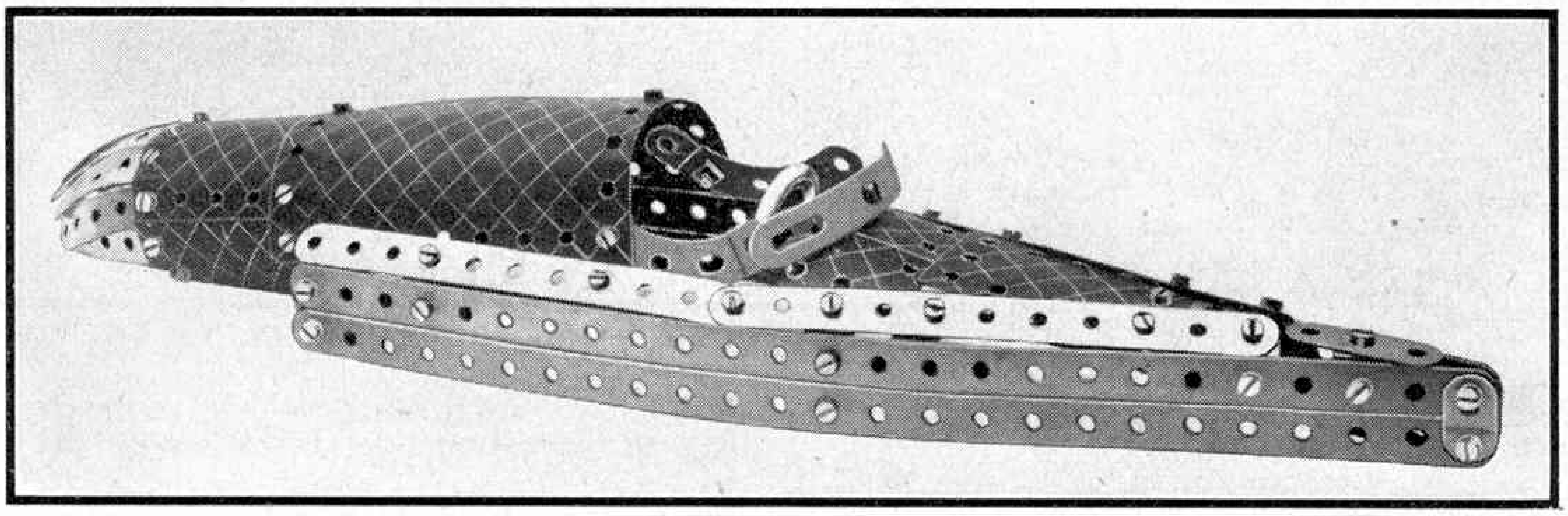


Fig. 1. This model of Sir Malcolm Campbell's "Bluebird" is a good example of the interesting subjects that racing motor boats provide.

The model-builder will have no difficulty in finding illustrations to guide him in his work. Pictures of well-known boats appear from time to time in the daily press, and the *"M.M."* is a particularly fruitful source of both illustrations and descriptions of various types of boats.

The smallest motor boats are driven by outboard motors, and apart from the construction of the vessel much pleasure can be obtained in building up an engine of this kind. An outboard motor is a small self-contained engine and propeller, which is attached to the stern of the boat by adjustable clamps. The smallest engines of this kind have only one cylinder, but some of the larger units have as many as four cylinders. The propeller is driven through bevel gears from a vertical shaft that is a continuation of the engine crankshaft. Steering is accomplished either by a rudder, or by swivelling the engine and propeller around by means of a tiller bar.

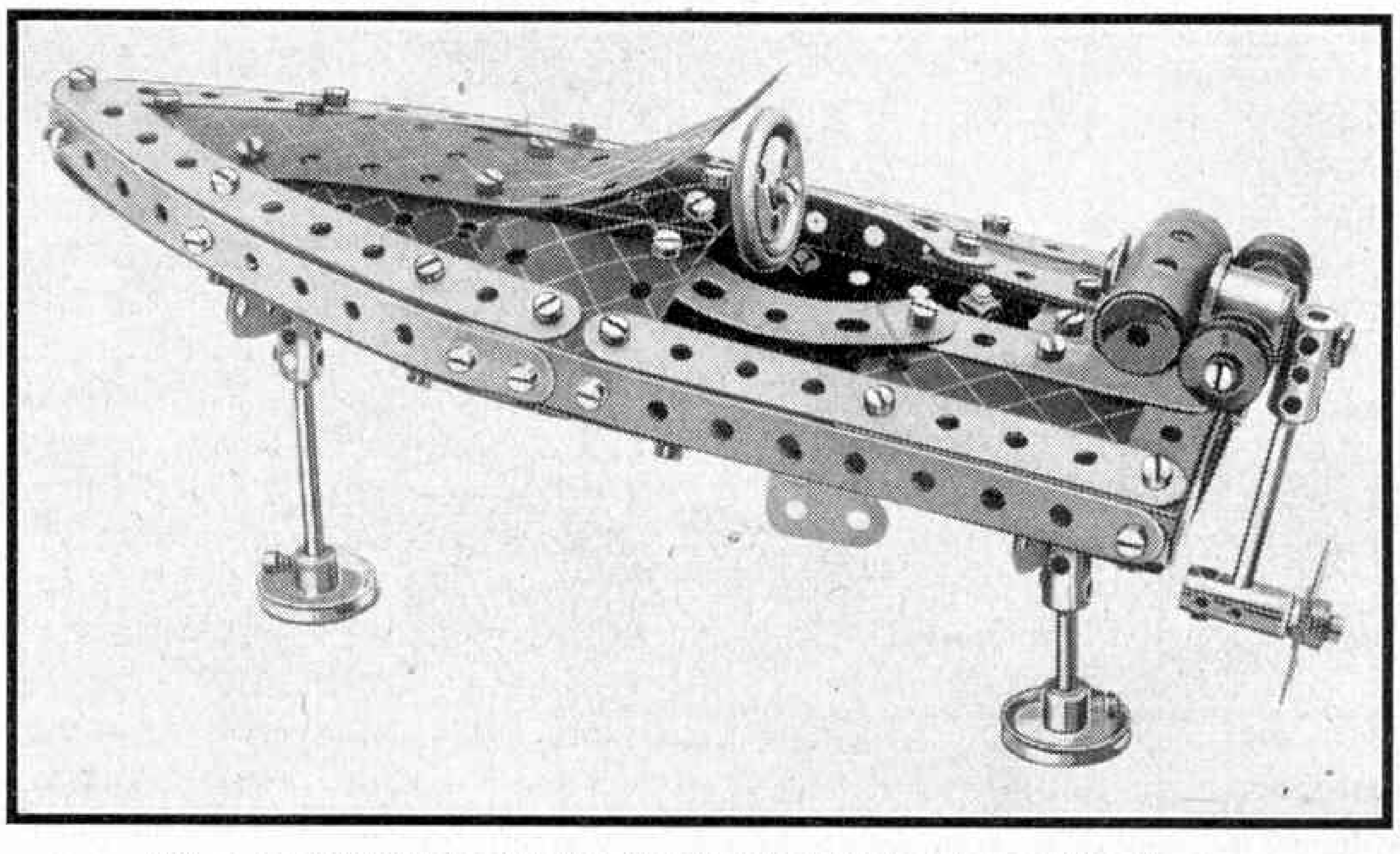


Fig. 2. A model of a famous French racing boat fitted with an outboard motor.

The hull of a racing boat requires very few parts for its construction, and usually each craft has some particular features that can easily be brought out in model form. In some small boats, for example, the pilot is protected from spray by a cowling at the bows. Steering with one hand and holding on to the boat with the other, the pilot can lean well over to prevent the boat overturning when rounding a buoy. A boat of this type forms a good subject for owners of small Outfits, as little detail work is necessary. A good representation of an outboard motor can easily be made with a few parts, using Double Brackets and Angle Brackets for the cylinder and ¾″ Discs for the crank-case and flywheel. If the boat is a waterline model even fewer parts will be required, for the propeller and its mounting can be omitted.

Larger models call for the inclusion of more detail, and a more realistic representation of the engine. The reproduction of the complete hull also can be attempted, and generally the most noticeable feature of this is the "step," which usually is placed half or one third of the length of the boat from the bows. The step of a racing motor boat is similar to that of the hull of a flying boat or a seaplane float, and its chief function is to raise the prow of the boat when in motion so that the boat planes across the surface of the water on a cushion of air trapped behind the step. In the case of small boats driven by outboard motors the bottom of the hull generally is flat or slightly curved, but some of them have Vee-shaped hulls.

The boat shown in Fig. 2 reproduces a well-known French racing boat that took part in a racing event on the River Seine last year. The hull is made from Strip Plates and Flexible Plates strengthened with Strips of various lengths, and in building it the deck plates and bottom were assembled separately and then joined together. The use of Flexible Plates made it quite easy to reproduce the graceful lines of the actual vessel, and the lack of perforations in these Plates gives the model a solid and sturdy appearance. The actual boat is steered by means of a handwheel, which takes the place of the usual tiller, and in the model this is represented by a 1″ loose Pulley fitted with a Rubber Ring.

The power unit is a twin-cylinder outboard engine of great power, and is copied as closely as possible with the aid of a Chimney Adaptor, which serves as the crank-case. It is fitted with two ½″ Pulleys to represent cylinders and a realistic petrol tank made with a Sleeve Piece. The propeller shaft is a 2″ Rod held in the longitudinal bore of a Coupling bolted to the Chimney Adaptor, and three Flat Brackets bolted to the end of a Threaded Coupling make a realistic propeller. The engine is mounted at the stern of the model by means of Angle Brackets.

A great amount of pleasure can be obtained in building up a realistic engine, and it is good fun selecting the most suitable parts for the purpose, the main object being to design each part of the engine of such a size that it is in keeping with the general proportions of the model.

Outboard engines are the most simple to build and excellent guidance on this part of the model can be obtained from the article and illustrations that appeared in the "*M.M.*" for July, 1937. A good example of an outboard motor built in Meccano was illustrated in the "*M.M.*" for January, 1934.

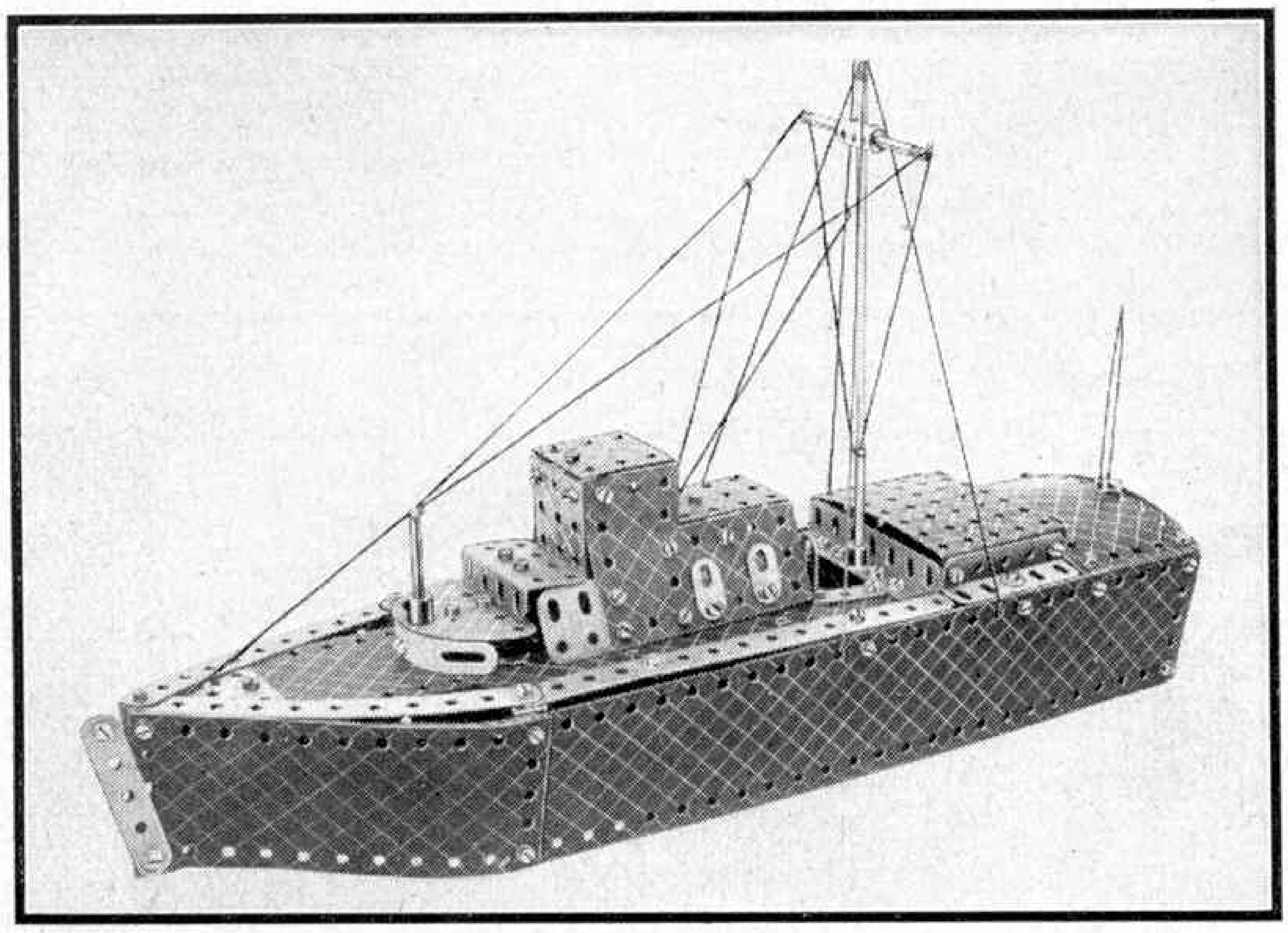


Fig. 3. Few parts are required to build this model of a customs patrol boat.

There should be no difficulty in finding suitable parts for reproducing the engine in a large model. For example, several 1″ Pulleys or ¾″ and 1¼″ Discs can easily be made into a realistic power unit, and the tailshaft casing for the propeller can be represented by a Rod.

The larger racing boats are more straightforward in construction from the point of view of model-building and such famous vessels as "*Bluebird*" and "*Miss Britain*" make particularly fine subjects. A model of "*Bluebird*" is shown in Fig. 1. The sides of the hull are built mainly with Strips, and the deck is made partly with Strips and Flexible Plates, which are sloped up towards the cockpit. The latter is situated in front of the engine, which is housed in a streamline tail built up of Flexible Plates. The tapered stern is completed with Strips.

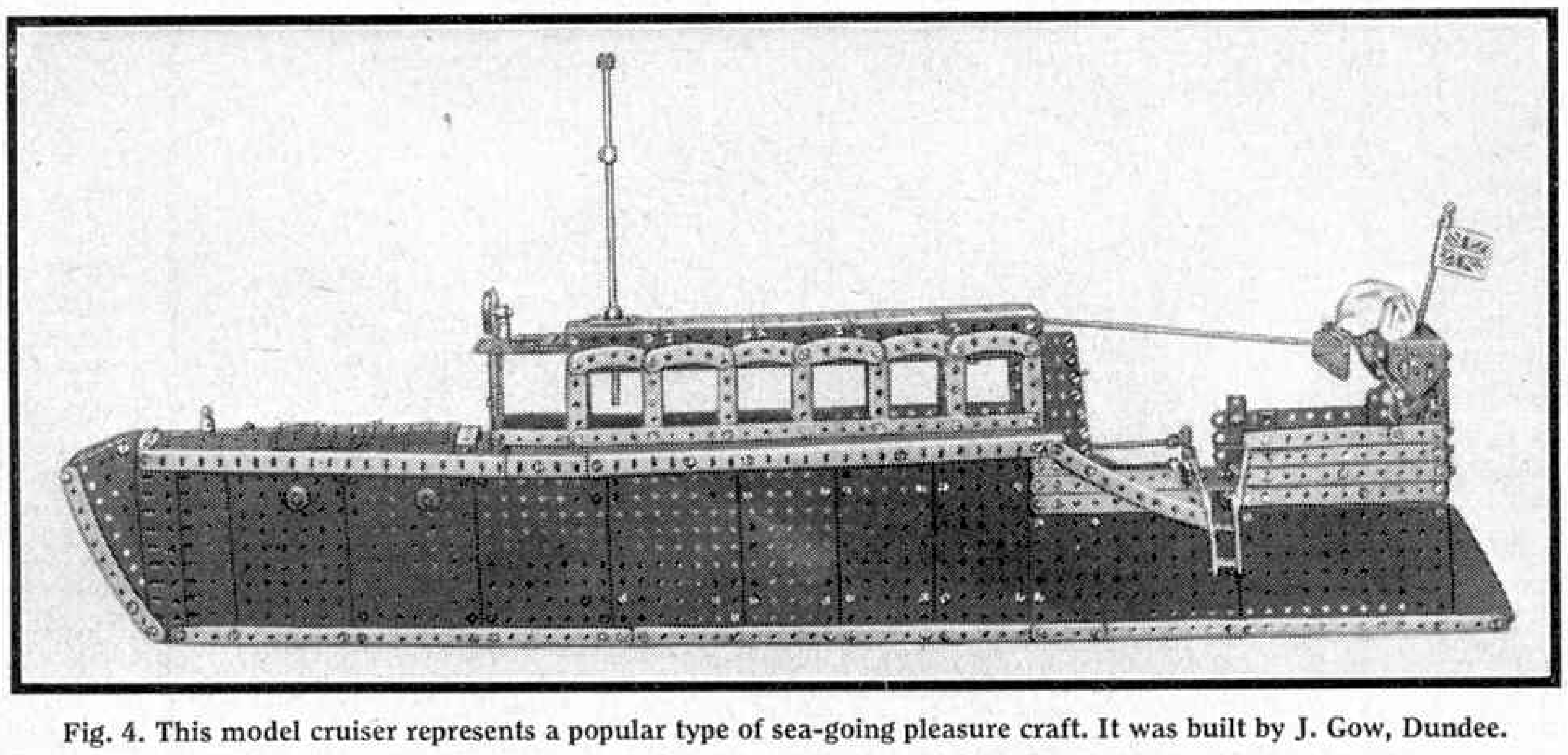


Fig. 4. This model cruiser represents a popular type of sea-going pleasure craft. It was built by J. Gow, Dundee.

An advantage of "*Bluebird*" as a subject for a model is that her main features are easy to reproduce. For instance, an alternative method of constructing her tapered stern is to use a Boiler, one end of which is tapered off with carefully bent Flexible Plates. If sufficient Flexible Plates are not available, the tapering can be effected quite as realistically with Strips about 3½ in. in length.

In order to reduce their resistance to wind pressure all high-speed motor boats are elaborately streamlined, and the engine usually is entirely concealed under a streamlined cowling. The absence of an engine, therefore, is not noticeable in a model of this type of craft, but when the stock of parts available permits it is of course best to model the engine in detail. Hinged covers can be provided for the engine pit so that they can be opened up to reveal the power plant when desired.

Apart from racing boats there are many other high-speed sea-going motor boats, such as patrol and customs boats. These types will be familiar to readers of the "*M.M.*," as several actual vessels were described in the December 1937 "*M.M.*" The splendid lines of these fast boats can be reproduced with Meccano parts by even inexperienced model-builders, and the lack of cumbersome deck fittings is a feature that will be appreciated by model-builders whose stock of parts is rather limited.

The hull of a boat of this kind is best made of Strip Plates, and the deck-houses can be constructed as separate units, the port-holes being represented by Washers, Flat Brackets or ¾″ Discs. A Drift (part No. 1083) makes an excellent mast as its tapered end looks much neater than the blunt end of a Rod. The aerial of the radio equipment, always a prominent feature, can be represented by Cord slung between insulators made of Washers. A Drift can be used also for the ensign mast, and an example of the use of these parts in the manner suggested is shown in the model customs patrol boat illustrated in Fig. 3. Owing to the small scale of this model the deck house is not reproduced in detail, but its shape is outlined with Flexible Plates and Flat Girders.

Another good example of a coastal patrol boat, which illustrates the possibilities of models of this type, is illustrated in the Instructions Manual for Outfits 7 and 8. In this model realism is added by the inclusion of Dinky Toys miniature figures, and ensigns and code flags painted on paper and glued to the rigging.

A wide field is covered by the numerous private motor cruisers often seen at sea ports and holiday resorts. The hulls of these vessels usually are similar in shape to those of large yachts, and much interesting work can be done in an endeavour to reproduce their beautiful curved sterns and high pointed bows.

Meccano Suggestions Section

By "Spanner"

(399) Spur Gear Differential (Professor D. R. Hartree, Manchester)

Various kinds of Meccano differentials built up from Bevel Gears, or with Contrate Wheels and Pinions, have been described from time to time in *"Suggestions Section."* This month we illustrate and describe a further type that is made entirely with spur gears. Units of this kind are used in real engineering when very heavy loads have to be dealt with, and in view of the ease with which such a differential can be assembled many model-builders no doubt will like to experiment with this type as a change from the more usual varieties.

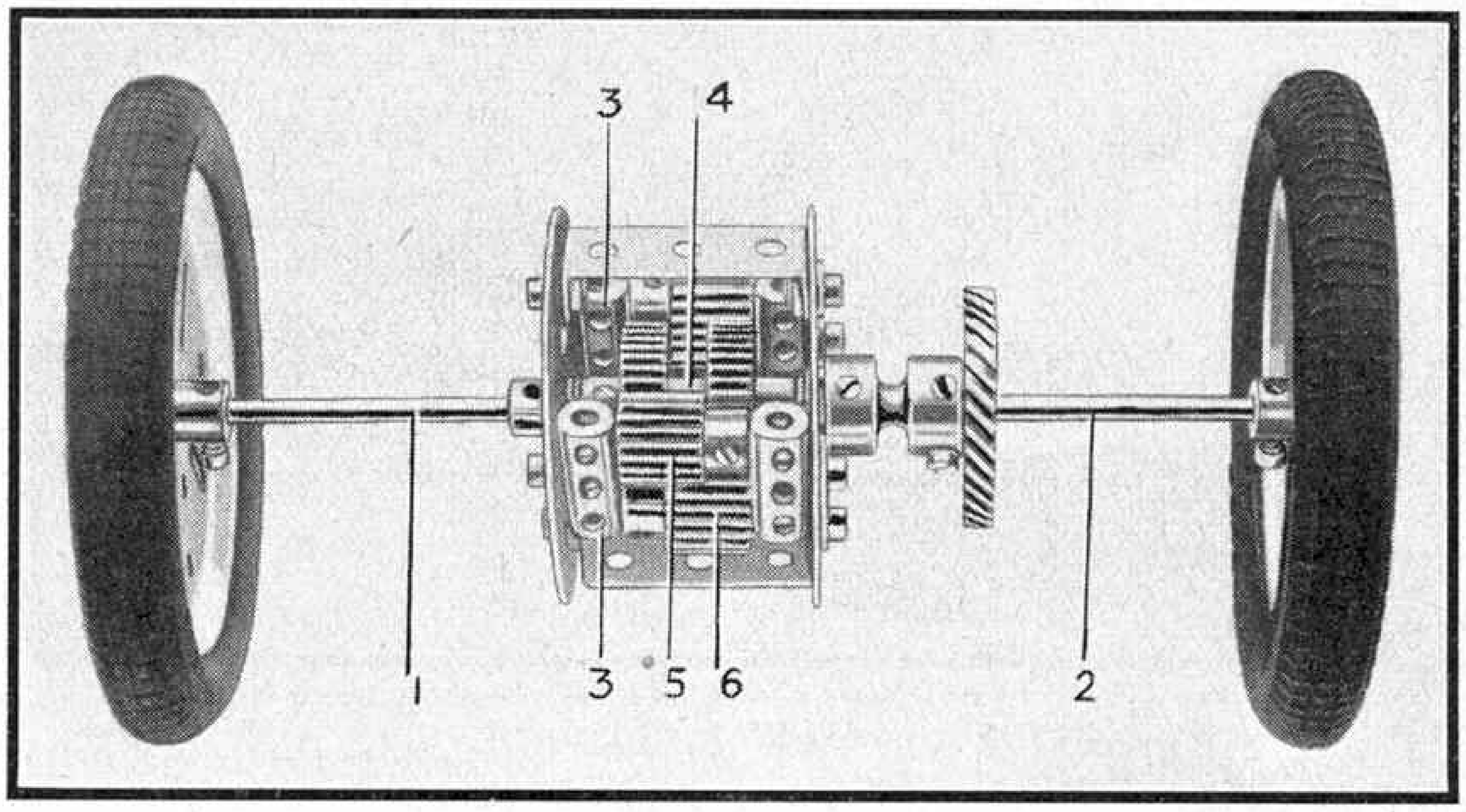


Fig. 399

The compact example shown in Fig. 399 was designed by Professor D. R. Hartree, Manchester, who built the Meccano differential analyser illustrated and described in the *"M.M."* for June 1934. It is shown here as it would be fitted for use in a model motor vehicle, the drive being taken through a 1½″ Helical Gear fastened to the cage by means of a Socket Coupling.

The cage in which the mechanism is contained consists of two Face Plates joined by two 1½″ × ½″ Double Angle Strips, one end of each Double Angle Strip being spaced from the Face Plate by a Washer. Rod 1 is pushed through the boss of the left-hand Face Plate and carries two Washers, a 1″ Gear, a Collar 4 and another Washer. Rod 2 carries two Washers and a 1″ Gear, and the latter is so arranged on the Rod that Rod 1 protrudes about ¼″ into its boss, thus making the axle assembly more rigid.

The ½″ × ½″ Pinions 5 and 6, and a similar pair of Pinions diametrically opposite to them, are fastened on 1″ Rods, using the new short Grub Screws (Part No. 69c). The Pinions are then engaged in the manner shown and Couplings 3 are fitted on the 1″ Rods. The Pinions and Couplings are then placed in the differential cage and held in place by ⅜″ Bolts, which pass through the slotted holes in the Face Plate so as to permit the Pinions to mesh properly with the 1″ Gears. Pinion 5 meshes with the left-hand 1″ Gear only and Pinion 6 meshes with the right-hand Gear. It is important that diametrically opposite Pinions are arranged to mesh with the same Gear.

If desired the casing can be completed by bolting two 5½″ × 1½″ Flexible Plates, or further 1½″ × ½″ Double Angle Strips, around the Face Plates. To transmit the drive to the cage, a 1½″ Helical Gear is gripped in a Socket Coupling and the latter is fastened to the boss of the right-hand Face Plate.

When the cage is rotated, the drive is transmitted to the Rods 1 and 2 by the Pinions, which do not rotate. If the Wheel or Rod 1 is held firmly, however, Pinions 5 immediately ride around the 1″ Gear. Their movement is transmitted through Pinions 6 to the other 1″ Gear, thus turning Rod 2. A similar procedure takes place when the other wheel or Rod 2 is gripped.

(400) A Neat Roller Bearing Unit

(W. McColl, Winchester, and R. Purton, Boreham Wood)

In building model cranes, mechanical excavators and similar engineering structures in which heavy rotating superstructures are required, it is advisable to incorporate some kind of roller bearing. There are several different kinds of suitable bearings, each of which can easily be made up with Meccano parts, and some of these have already been described in *"Suggestions Section."* Another type is shown in Fig. 400. This was designed by W. McColl, Winchester, and makes use of the Flanged Disc that forms part of the Ball Bearing (Part No. 168). A useful feature of this unit is that the drive to the superstructure is inside the cab, thus eliminating the exterior driving shaft and pinion necessary with most other types.

The lower Flanged Disc 1 is mounted on the platform of the model, beneath which is bolted a Double Arm Crank so that its boss, in which is a 2″ Rod 3, coincides with the centre of the Disc. The eight rollers 2 are ¾″ Flanged Wheels, each of which is free to rotate on a Pivot Bolt that is lock-nutted to an Angle Bracket bolted to a Face Plate. The Face Plate is placed on Rod 3 followed by a second Flanged Disc, which is bolted to the underside of the superstructure to be rotated.

Rotation of the superstructure is carried out as follows. A 57-teeth Gear 4 is fastened on Rod 3 and is arranged to mesh with a Worm. When the Bush Wheel is rotated the Worm pulls itself and the superstructure around the 57-teeth Gear.

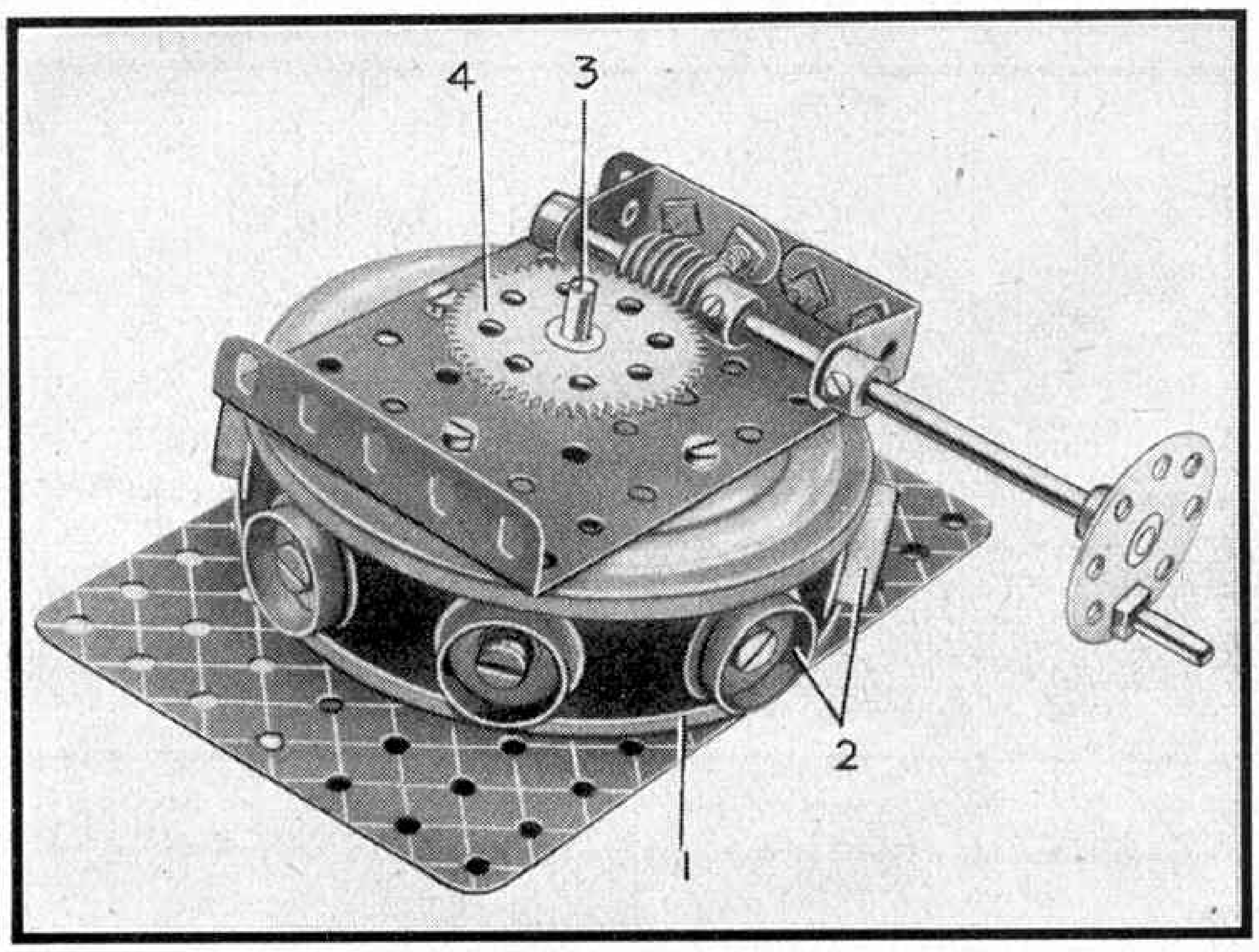


Fig. 400

R. Purton's suggestion concerns a different type of unit, which is similar in certain respects to one suggested by Alister Inlay, Skene, which was described in the December 1937 *"M.M."* The unit is compact and easily assembled, and is particularly suitable for use in small models. In making it a 1½″ Pulley and a 2½″ Gear are bolted inside and outside a Wheel Flange respectively. Steel Balls are arranged in the Wheel Flange and above them is placed a 2″ Sprocket Wheel. Reversed Angle Brackets are bolted to the latter, and they in turn carry a 3½″ × 2½″ Flanged Plate. This unit is then fitted on the 2″ Rod already mentioned, and is retained in position by a Collar. The superstructure, which can be built up on the Flanged Plate, is rotated by a ½″ Pinion on a vertical Rod journalled in the Plate, the Pinion meshing with the 2½″ Gear bolted to the Wheel Flange.

In order to mount the unit on a base the 2½″ Gear is bolted to a 5½″ × 2½″ Flanged Plate, and spaced from it by Washers and Collars. Alternatively, the Gear can be spaced by Washers from a 4″ Circular Plate mounted in a frame of Angle Girders. The spacing Washers permit the Pinion to mesh with the 2½″ Gear.

If desired the superstructure can be rotated by Sprocket drive.

(401) Trailer Steering Gear

(B. Farrar, Dagenham)

An important problem in the design of trailer vehicles is the provision of efficient steering mechanism. In the simplest type of gear the front axle is pivoted at its centre and is connected by a draw-bar to the rear of the hauling vehicle. As the trailer tends to turn in a smaller arc than the hauling vehicle this system is suitable only for small and light trailers. If it is used for a large and heavily loaded vehicle the work of steering is fatiguing for the driver.

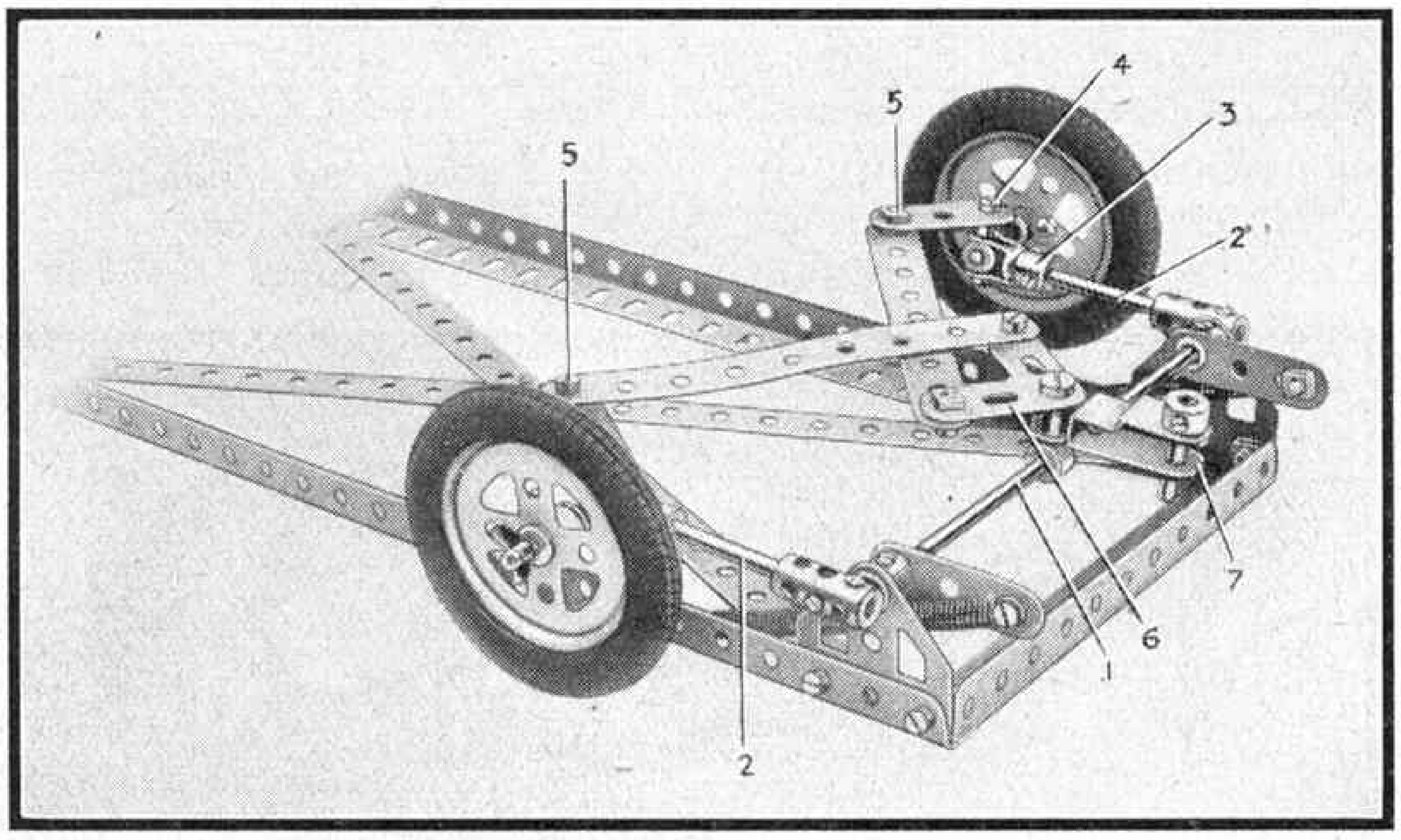


Fig. 401

A steering system suitable for a heavy trailer forms the subject of a suggestion submitted by B. Farrar, Dagenham. In this the wheels are mounted on stub axles, and the arrangement is such that the inner wheel is turned at a sharper angle than the outermost wheel. An advantage of this system is that the wheel track is the same when the trailer is turning as when the two vehicles are travelling in a straight path.

The stub axles for the road wheels are mounted on two 2½″ Rods 2, which are connected by Couplings to a 6½″ Rod 1. On this Rod are mounted two Cranks and a Collar, and the Cranks are connected by Springs to the chassis of the trailer to provide a suspension system. A Swivel Bearing 3 is fixed on the end of each Rod 2, and in the "spider" of each Swivel Bearing is fastened a 1½″ Rod that forms the stub axle for the wheel. One of the set-screws is removed from each Swivel Bearing and is replaced by a ⅜″ Bolt 4, against the head of which is locked a 1½″ Strip.

A Boss Bell Crank 6, carried on a Pivot Bolt screwed into the Collar on Rod 6, is locked in place with a nut. The trailer draw-bar 7 is a Cranked Bent Strip, which is attached to the boss of the Boss Bell Crank by a bolt that carries a nut and washer for spacing purposes. The Bell Crank and the 1½″ Strips are linked by 5½″ Strips, each of which is carried on lock-nutted bolts. The wheels are 2″ Pulleys, and are spaced from the Swivel Bearings by Spring Clips and Washers.

When the draw-bar 7 is connected to the hauling vehicle the tension on the draw-bar maintains the wheels parallel. When the draw-bar is pulled to one side as the vehicle turns the links transmit the movement to the 1½″ Strips, thus causing the trailer to follow the same path as that traversed by the hauling vehicle.

Although the mechanism shown in Fig. 401 is assembled in conjunction with a torsion spring arrangement, it is not absolutely necessary to adhere to this type of springing, as the steering gear works well with semi-elliptic springs. Springs of this type were described in *"Suggestions Section"* for February 1937, and are more suitable for a model that carries heavy loads. Strong torsion springs were described in the December 1936 *"M.M."*

(402) Model Aeroplane Winder

(H. Wright, Sedbergh)

The device shown in Fig. 402 was designed by H. Wright for winding up the elastic motors in his small model aeroplanes. The gearing used in the device gives 10 revolutions of the hook to one revolution of the handle, and enables the elastic to be "wound" in a very short time.

The gearing is contained in a frame made from two 3½″ × 2½″ Flanged Plates joined by two 2½″ × 2½″ Flat Plates. A handle for holding the winder is made from a Wood Roller mounted on a 5″ Screwed Rod. A 5″ Rod prevents the Roller from rotating.

Rod 1 is 3½″ long, and carries a 1½″ Helical Gear and a Ratchet Wheel 2 in addition to the handle. At right angles to this Rod is a 4″ Rod 3, which passes below the 2½″ × 1½″ Flanged Plate inside the frame. Rod 3 carries a ½″ Helical Gear and a 50-teeth Gear, and is held in place by two Collars. The 50-teeth Gear meshes with a ¾″ Pinion on Rod 4, which carries also a second 50-teeth Gear that engages the ¾″ Pinion on 2½″ Rod 5. It is advisable to use double Grub Screws in all the Gears and Pinions in order to fix them securely on their Rods.

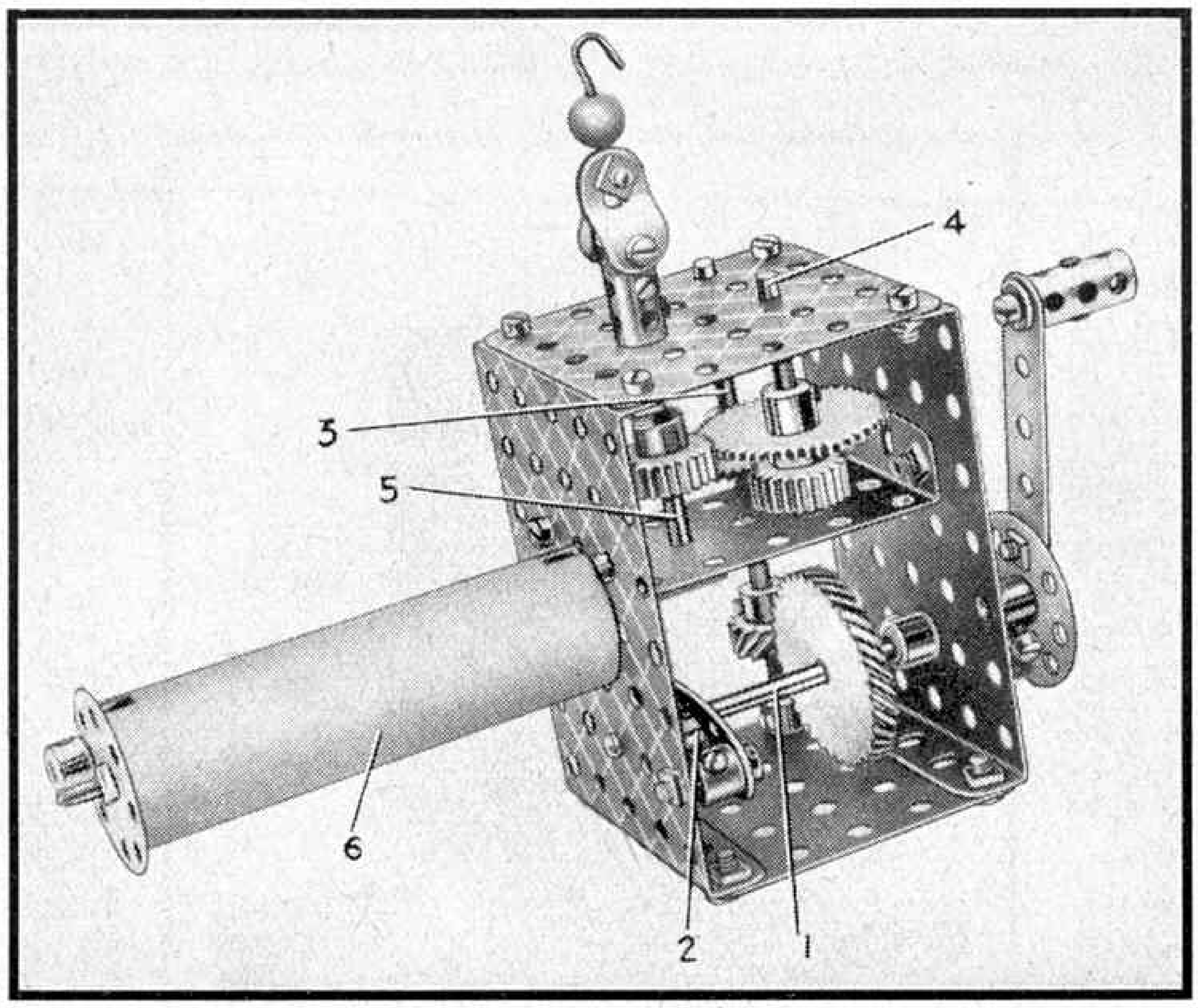


Fig. 402

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(M.200.) P. LeFevre, Harleston, Norfolk, submitted details of a novel device that he suggests could be used as an electric tooth cleaner. The device is not really suitable for this purpose, but I am describing it here because it incorporates a rapid reciprocating movement that is adaptable for use in a variety of other mechanisms.

The mechanism is contained in a Boiler, in one End of which is a Magnet Coil, complete with Core. Opposite this, and protruding through the other End of the Boiler, is an 11½″ Rod fitted with a Collar. A Double Arm Crank is fastened to the Rod so that it makes contact with an insulated 6 B.A. Bolt, which is connected to one terminal of a battery. The Crank is connected to one of the terminals of the Magnet Coil, the other terminal of which is connected to the remaining free terminal of the battery. A small spring normally holds the Double Arm Crank in contact with the 6 B.A. Bolt, but when the current is switched on the 11½″ Rod is drawn towards the Magnet Coil. This movement breaks the electric circuit, which is completed again when the 11½″ Rod slides back under the influence of the spring. If the distance between the Collar and the Magnet Coil and the tension of the spring is carefully adjusted, very rapid movement can be obtained.

I shall be interested to hear of any uses to which this or a similar mechanism is put.

(M.201.) It is not often that spoked rubber-tyred wheels are required in model-building, but when P. Kemp, Market Drayton, needed such parts for a model gun carriage he was able to build up neat wheels from standard Meccano parts. He discovered that the Wheels, Part No. 19a, can be used in conjunction with the 3 in. Rubber Tyres, Part No. 142b.

One Wheel is fastened on a Rod and the Rubber Tyre is fitted against its rim. A second wheel is then pushed against the other side of the Tyre. The complete wheel is quite solid and there is no likelihood of the Tyre coming off.

Smaller wheels of this kind can be built up by using the Steering Wheels, Part No. 185, and 1½ in. Rubber Tyres, Part No. 142d.

(M.202.) From P. Mountfort, Howera, New Zealand, comes a suggestion for a simple type of screw brake for use on small model trucks. A Coupling is mounted longitudinally on the axle of the model and a 1″ Screwed Rod is partly screwed into its transverse threaded bore. The other end of the Screwed Rod carries a Collar by which it is screwed into contact with the axle.

New Meccano Models

Four Interesting Designs for Small Outfits

IN selecting the models for description this month we have included three of special interest to owners of small Outfits, together with a fine dumping wagon that requires an Outfit No. 7 for its construction. Of the small Outfit models the first is a realistic three-wheel sports car, which is shown in Fig. 1 and can be built with Outfit No. 0. The second is the letter balance seen in Fig. 2. This is built with Outfit No. 2, and if it is carefully adjusted letters can actually be weighed upon it with sufficient accuracy for general use. Finally comes a working model of a clothes wringing machine, Fig. 4, which can be made from the contents of Outfit No. 3.

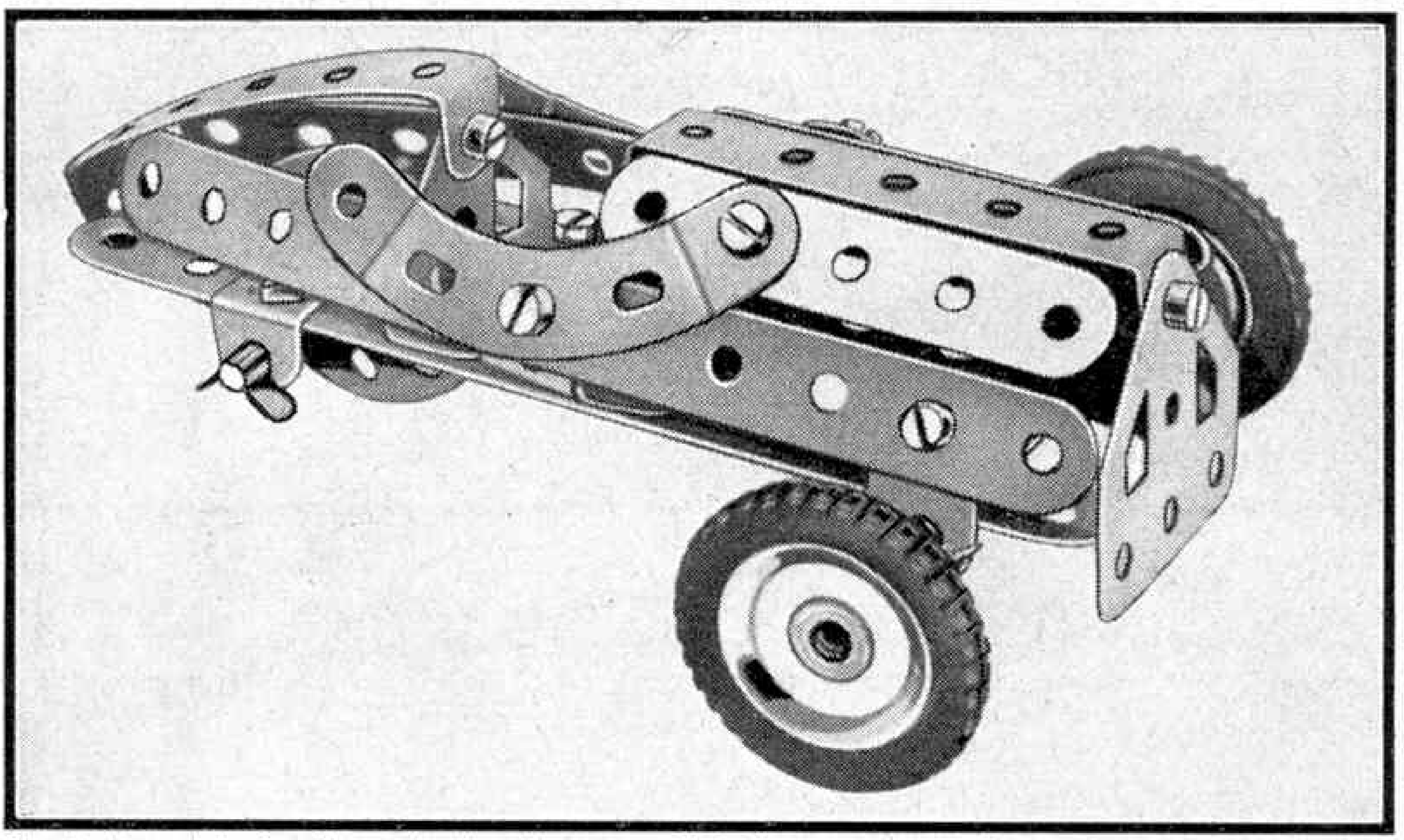


Fig. 1. A model of a three-wheel racing car, which forms an interesting subject for Outfit No. 0.

Construction of the three-wheel car is commenced by making the chassis, which consists of two 5½″ Strips joined by two Trunnions so arranged that one of them forms the rear and the other the front of the driver's cockpit. The sides of the body of the car also consist of 5½″ Strips, two of which are fastened to the chassis by Angle Brackets. The bonnet is formed with a 2½″ × ½″ Double Angle Strip and two 2½″ Strips. At its rear end the Double Angle Strip is supported by the Trunnion that represents the front of the cockpit, and a Trunnion suspended from its front end represents the radiator. The 2½″ Strips are fastened by 2½″ small radius Curved Strips to the 5½″ Strips that form the sides of the car. A second Double Angle Strip, which is bolted to the Trunnion at the rear of the cockpit, is used to fill in the top of the tail of the car.

The two front wheels are fixed at the ends of a 3½″ Rod passing through two Flat Brackets bolted to the sides of the car. Spring Clips prevent the Rod from sliding. The rear wheel is a Bush Wheel, and is fixed at the centre of a 2″ Rod, each end of which is supported in a bearing formed by an Angle Bracket bolted to the 5½″ Strips of the chassis.

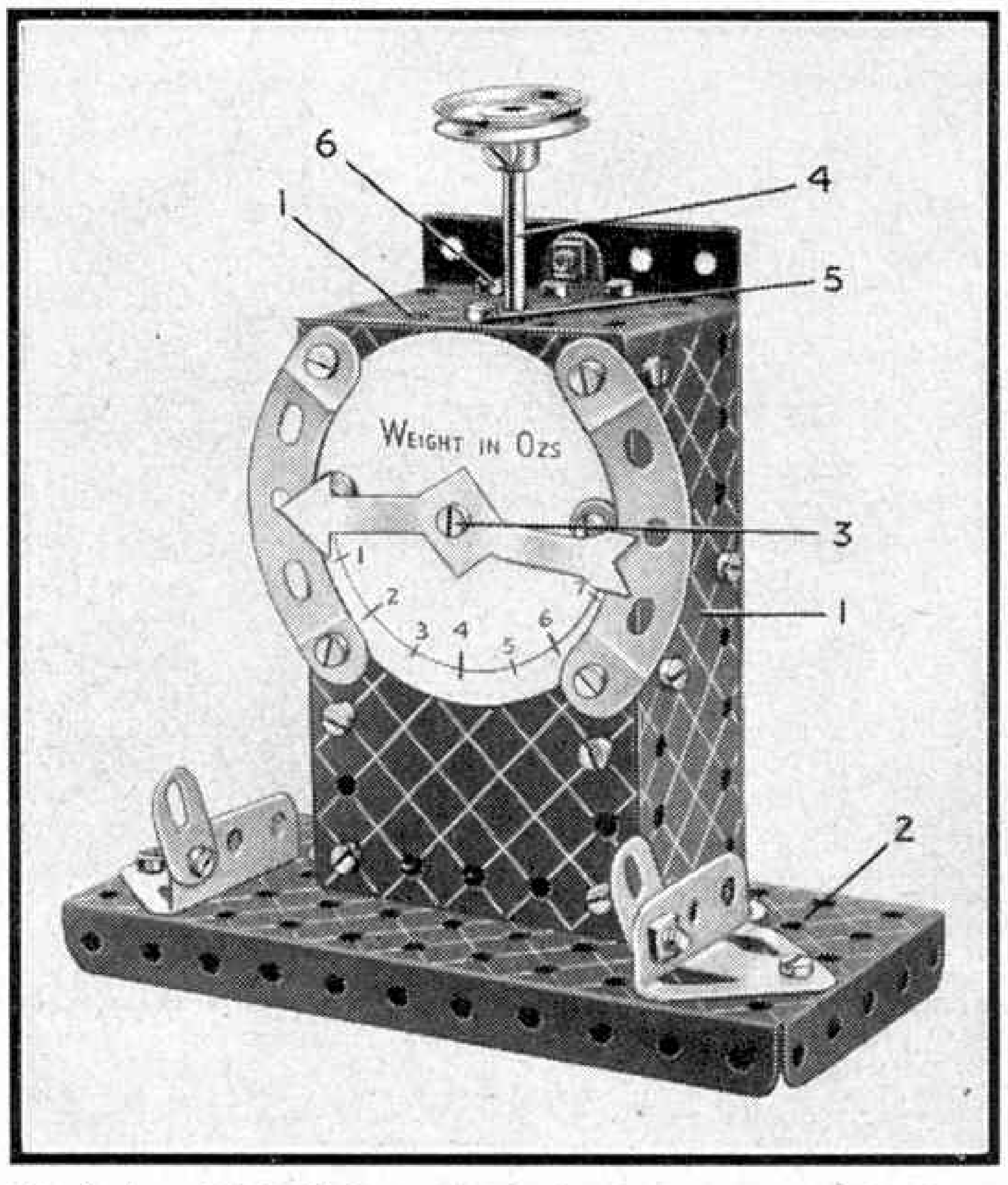


Fig. 2. A neat letter balance that is simple to construct and adjust. It can be built with Outfit No. 2.

Parts required to build model racing car: 4 of No. 2; 2 of No. 5; 2 of No. 10; 4 of No. 12; 1 of No. 16; 1 of No. 17; 2 of No. 22; 1 of No. 24; 24 of No. 35; 19 of No. 37a; 19 of No. 37b; 2 of No. 48a; 2 of No. 90a; 2 of No. 126; 1 of No. 126a; Two 1″ Rubber Tyres (not included in Outfit).

The neat and practical letter balance illustrated in Fig. 2 is simple to build and can readily be calibrated or adjusted to make it useful. It is made by fastening two 5½″ × 1½″ Flexible Plates 1 to a 5½″ × 2½″ Flanged Plate 2 by means of Angle Brackets. The Flexible Plates are 2½″ apart, and have their upper ends bent over and bolted together. The front of this structure is filled in by a compound plate, consisting of a 2½″ × 2½″ and a 2½″ × 1½″ Flexible Plate joined by two 2½″ Strips, which is secured in position by a 2½″ × ½″ Double Angle Strip and two Angle Brackets.

The dial of the balance is a disc of white cardboard 2½″ in diameter, and is marked as shown in the illustration, with a scale that extends only halfway round it. The disc is bolted to the upper end of the compound plate, with a Curved Strip on each side of it. The pointer also is made of cardboard and is fastened by a nut on the shank of a ⅜″ Bolt 3, which is passed through a hole in the centre of the dial and has a Bush Wheel locked on its inner end.

A Flat Bracket, bolted at right angles to the end of a 2½″ Strip, is next fastened by a lock-nutted bolt to the Bush Wheel, so that the Bush Wheel and the pointer turn if the 2½″ Strip is pulled downwards. To the free end of the 2½″ Strip is lock-nutted an Angle Bracket, and in this the end of the 3½″ Rod 4 is secured by Spring Clips. The Rod is journalled in the top of the casing, and also in a Reversed Angle Bracket held by Bolt 5.

The pan on which letters to be weighed are placed is a 1″ Pulley fixed on Rod 4, and when the balance is not in use the Rod is held in its uppermost position by a Driving Band, which is looped around the Angle Bracket through which Rod 4 is fastened and also is held by Bolt 6. The back of the casing is filled in by a 4½″ × 2½″ Flexible Plate, which is secured in position by a 2½″ × ½″ Double Angle Strip and an Angle Bracket.

A neat addition that adds to the interest of the model is a pen rack on the base. This consists of two Trunnions, each fitted with a Flat Bracket, which are bolted to Plate 2.

Parts required to build letter balance: 3 of No. 5; 3 of No. 10; 8 of No. 12; 1 of No. 16; 1 of No. 22; 1 of No. 24; 3 of No. 35; 38 of No. 37a; 35 of No. 37b; 2 of No. 38; 2 of No. 48a; 1 of No. 52; 2 of No. 90a; 1 of No. 111c; 1 of No. 125; 2 of No. 126; 1 of No. 186; 1 of No. 188; 2 of No. 189; 1 of No. 198.

The largest of the four models described this month, and the one offering most scope for owners of larger Outfits, is the dumping wagon shown in Fig. 3. Wagons of this kind are used by building contractors for carrying cement from the mixers and discharging it where required for use. They are driven by small oil engines, and have a scoop-like container at the forward end. This container is pivoted at its centre so that it can be tipped to discharge its contents.

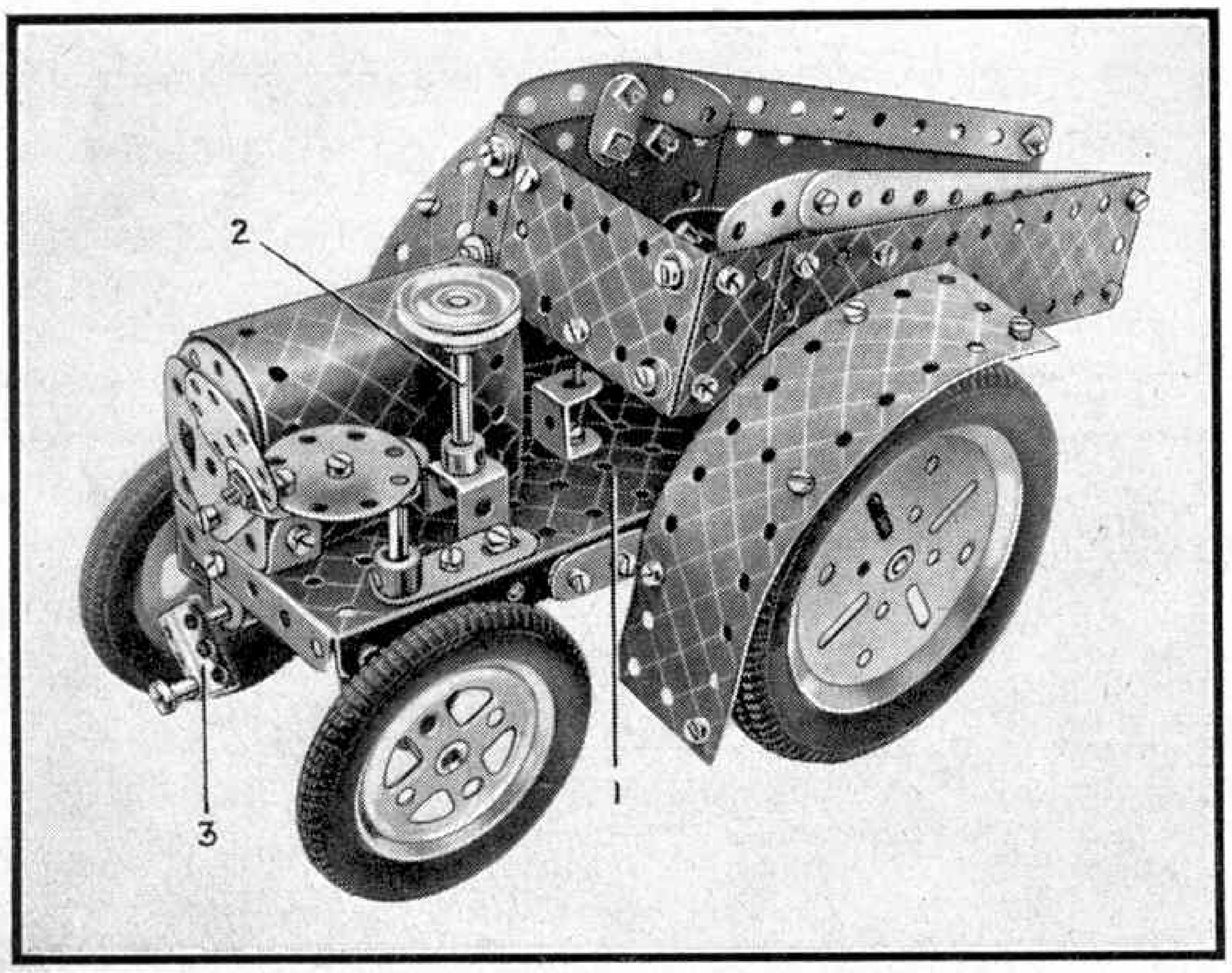


Fig. 3. A model of a tipping wagon used by building contractors for carrying cement from the mixing machine and dumping it in the required place. It is made from the contents of Outfit No. 7.

The chassis of the Meccano model is a 5½″ × 2½″ Flanged Plate 1, which is mounted on wheels consisting of two 2″ and two 3″ Pulleys. The bearings of the rear axle are Flat Trunnions bolted to the sides of the Flanged Plate 1. The stub axles for the front wheels are represented by 1½″ Rods journalled in Double Brackets, which are pivotally attached by lock-nutted bolts to Angle Brackets fastened to the flanges of the Flanged Plate 1. A 3½″ Strip forms the tie-rod, and is connected by 1½″ Strips to the Double Brackets. The steering wheel is a 1″ Pulley locked on the upper end of a 3½″ Rod 2, which is journalled in the Flanged Plate 1 and a Double Bent Strip bolted to the Plate. At its lower end Rod 2 carries a Bush Wheel, and the latter is joined to one end of the tie rod by a compound 4″ strip.

The container is built up by extending the wider end of a Flanged Sector Plate by a 2½″ × 2½″ Flexible Plate, and attaching on each side a compound plate consisting of a 5½″ × 1½″ and a 2½″ × 1½″ Flexible Plate. The back consists of two 2½″ × 1½″ Flexible Plates. The pivot on which the container turns is a 3½″ Rod that passes through the ends of a 1½″ × ½″ Double Angle Strip bolted underneath the container. The Rod is supported by a 2½″ × 1½″ Double Angle Strip fastened to the forward end of the Flanged Plate 1, and the container is supported in a horizontal position by a Double Bracket, also bolted to this Flanged Plate.

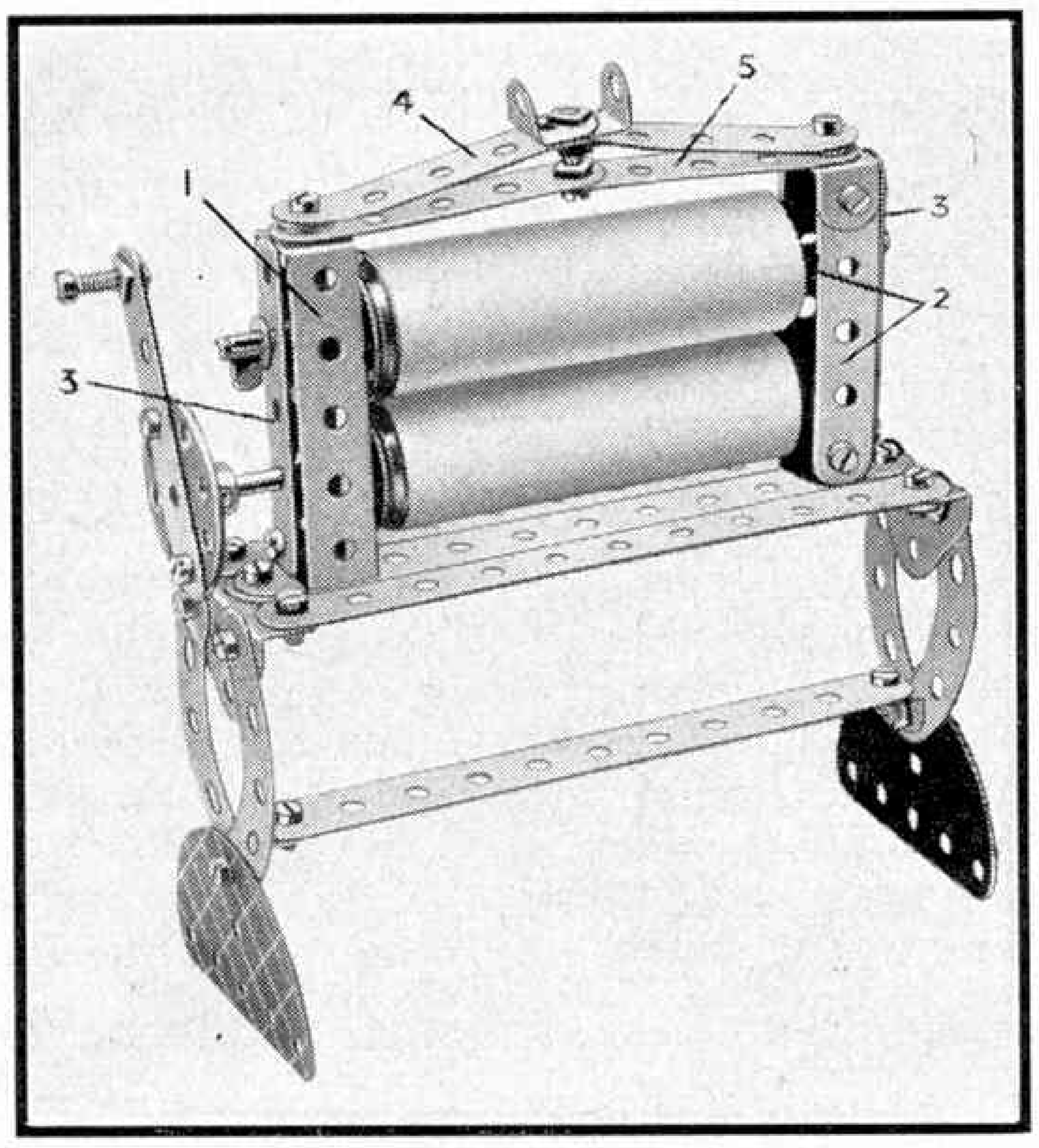


Fig. 4. This working model of a wringing machine, constructed with contents of Outfit No. 3, has a realistic pressure device.

The container is tilted by turning a handle 3 at the rear of the model. The handle is formed by a Coupling, which is fitted with a Pivot Bolt, as shown, and locked on the end of a 4½″ Rod. The latter is journalled in a Flat Bracket bolted to the rear flange of the Flanged Plate 1, and a 1″ × 1″ Angle Bracket fastened underneath it. One end of a length of Cord is fastened to the rod by means of a Cord Anchoring Spring, the other end of the Cord being passed through the Flanged Plate 1 and tied to the rear end of the bucket.

The engine casing is represented by a 4½″ × 2½″ Flexible Plate. This is curved to the required shape, and fastened in position by a 1½″ × 1½″ Double Angle Strip and an Angle Bracket.

Parts required to build model dumping machine: 4 of No. 2; 1 of No. 3; 6 of No. 5; 2 of No. 6a; 3 of No. 10; 3 of No. 11; 7 of No. 12; 3 of No. 12a; 1 of No. 15a; 3 of No. 16; 1 of No. 17; 2 of No. 18a; 2 of No. 19b; 2 of No. 20a; 1 of No. 22; 1 of No. 24; 81 of No. 37a; 71 of No. 37b; 10 of No. 38; 1 of No. 40; 1 of No. 45; 2 of No. 48; 1 of No. 48a; 1 of No. 52; 1 of No. 54a; 6 of No. 59; 2 of No. 62; 1 of No. 63; 4 of No. 111c; 4 of No. 126a; 4 of No. 188; 4 of No. 189; 1 of No. 190; 1 of No. 191; Two 2″ and two 3″ Motor Tyres (not included in Outfit 7).

The next model to be described is the wringing machine illustrated in Fig. 4. It is best to begin this by building the table supporting the rolling gear. The ends of three 5½″ Strips are joined by means of two Trunnions to form the top of the table, which is supported at each end by a leg consisting of two Curved Strips and a Semi-Circular Plate, built up as shown in the illustration. The two legs are joined at their centres by a 5½″ Strip and two Angle Brackets.

The supporting frame for the rollers is constructed by mounting two 2½″ × ½″ Double Angle Strips 1 and two 2½″ Strips 2 on the top of the table. Two more 2½″ Strips 3 are fastened by Angle Brackets to the table, for the purpose of providing bearings for the Rods carrying the rollers.

The spring pressure bar is represented by two compound 4½″ Strips 4 and 5, each of which is built up of two 2½″ Strips bolted together. The Strips are joined at their centres by a ⅜″ bolt, but are spaced apart a short distance. The bolt also carries two Angle Brackets, representing a handle for adjusting the pressure.

The rollers consist of cardboard tubes mounted on two 1″ Pulleys locked on a compound 5½″ rod. Each of the two compound rods is made up from a 3½″ and a 2″ Rod, but the Rods of one pair are joined by a Rod Connector and those of the other by a Rod and Strip Connector. The Rods are journalled in the Strips 3, and are fastened in position by Spring Clips.

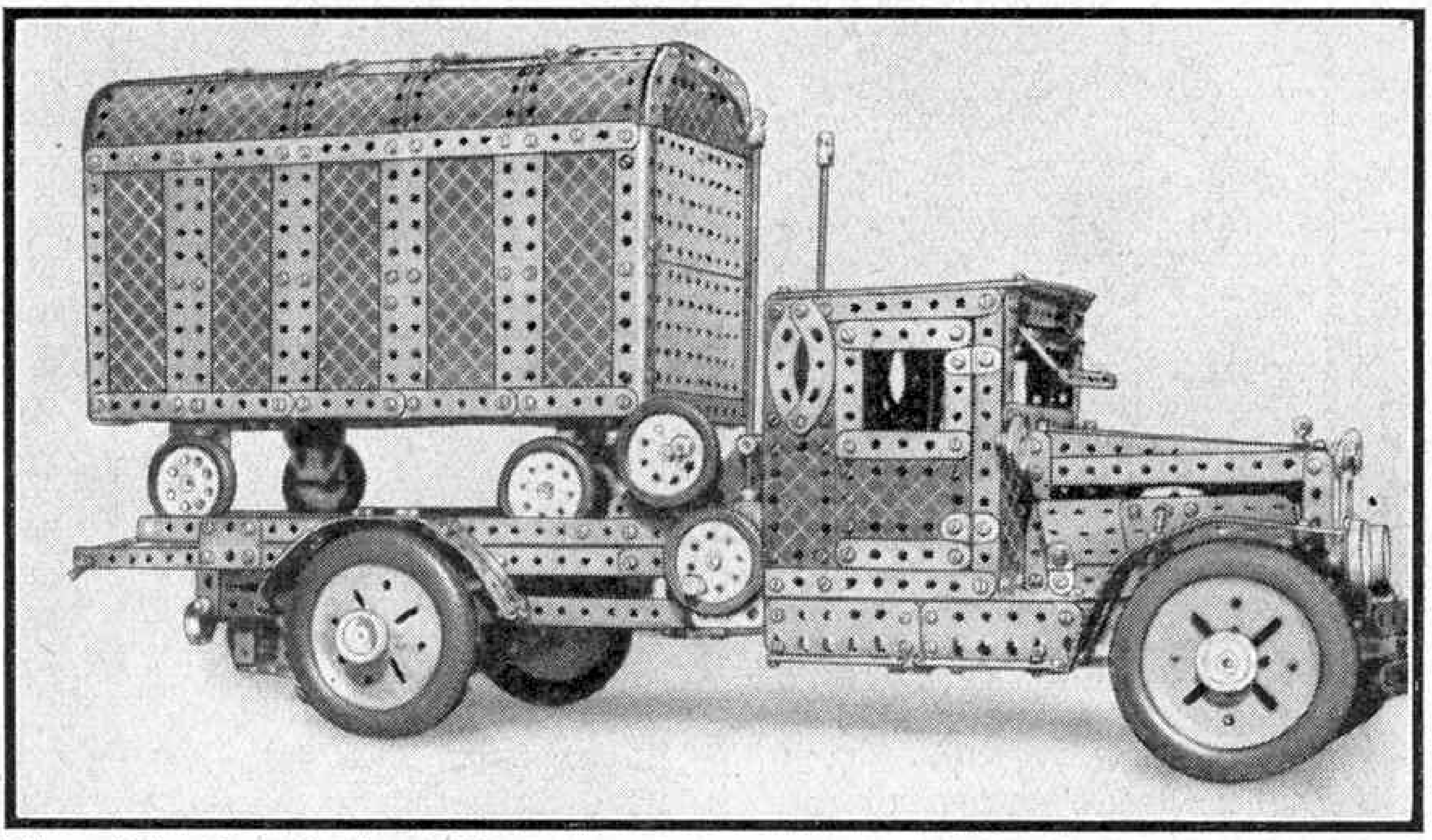
The handwheel consists of a Bush Wheel, across which a 2½″ Strip is bolted. The handle is represented by a ⅜″ Bolt, fastened by two nuts in the hole at the free end of the 2½″ Strip, and the Bush Wheel is locked on one end of the lower compound rod, as shown in the illustration.

Parts required to build model wringing machine: 4 of No. 2; 9 of No. 5; 1 of No. 11; 8 of No. 12; 2 of No. 16; 2 of No. 17; 4 of No. 22; 1 of No. 24; 1 of No. 35; 31 of No. 37a; 26 of No. 37b; 1 of No. 38; 2 of No. 48a; 4 of No. 90a; 2 of No. 111c; 3 of No. 126; 2 of No. 214.

Meccano Competitions Open to All Readers

"Winter" Model-Building Contest

This month we announce another of the popular general competitions in which Meccano models of any kind may be entered. It is not necessary to own a large Outfit to win one of the splendid prizes offered, for small models often prove the most original and interesting, and they will receive just as much attention from the judges as the larger ones.



This realistic refuse collecting vehicle was built by G. S. King, Tooting, S.W.17, and is a good example of the kind of model suitable for entry in the "Winter" Competition announced on this page.

As is the case with all model-building competitions announced on this page, the Contest is open to *"M.M."* readers of all ages living in any part of the world. The only condition is that models submitted must be the unaided work of competitors, both in regard to design and construction. Competitors should choose their subjects carefully, for the more interesting and novel a model is the greater will be its chance of winning a prize.

When the model is completed, it should be photographed or, if this is not possible, a good drawing of it should be made. The photographs or drawings need not be the work of the competitor himself. A short explanation of the constructional details of the model should then be written, and this, together with the photograph or drawing, should be posted to *"Winter General Model-Building Contest,"* Meccano Ltd., Binns Road, Liverpool 13. It is most important that the competitor's age, name and full address is written on the back of each photograph or drawing sent in.

The Contest will be divided into two Sections as follows: A, for competitors of all ages living in the British Isles; B, for competitors of all ages living Overseas. The age of each competitor will be taken into consideration in judging the entries, so that all competitors will have equal chances of success. The prizes to be awarded in each Section are: First, Meccano products value £3/3/–; Second, products value £2/2/–; Third, products value £1/1/–. There will also be five prizes of products value 5/– and a number of consolation awards in each Section.

Entries for Section A must be posted in time to reach Liverpool on or before 31st March, 1938, but the closing date for Section B is extended until 31st May, 1938, in order to allow readers in Overseas countries ample time in which to prepare and submit their entries.

It should be noted that photographs or drawings of models that are awarded prizes become the property of Meccano Ltd., but unsuccessful entries will be returned to the senders if a stamped and addressed envelope of the necessary size is enclosed with the entry for that purpose.

"Most Useful Meccano Parts" Competition

At the foot of this page is a list of 15 Meccano parts. Readers are asked A, to select from these the part that they think is the most useful in model-building, and B, to make out a list of the six parts that they think will receive the most votes when the "A" votes of all competitors are added together, placing these in their estimated order of popularity. A competitor need not put at the head of his list the part he himself thinks most useful, unless he believes that this will be general opinion. He should put it in the position that he thinks the massed votes will give it.

Entries should be sent on postcards, and each must bear the competitor's name and address. The correct name and catalogue number of each part must be given and entries should be addressed *"Most Useful Parts Voting Contest,"* Meccano Ltd., Binns Road, Liverpool 13. The closing date for all entries is 30th April, 1938.

Prizes will be awarded to competitors whose lists are nearest to the final result. The prizes will be as follows: First, Meccano products value £2/2/–; Second, products value £1/1/–; Third, products value 10/6. A number of consolation prizes also will be awarded.

If several competitors succeed in placing the six most useful parts in the correct order as decided by the votes of all competitors, the novelty or neatness of their entries will be taken into consideration in making the awards. No competitor may submit more than one entry.

Competitors who are awarded prizes will be notified as soon after the closing date as possible, and will be allowed free choice of products to the value of their awards from current Meccano and Hornby price-lists.

"Most Useful Meccano Parts" Competition

Select your Parts from this List

Part No.	Part	Part No.	Part
12c.	Obtuse Angle Bracket	126a.	Flat Trunnion
24.	Bush Wheel	189.	Flexible Plate, 5½″ × 1½″
45.	Double Bent Strip	198.	Hinged Flat Plate
48a.	Double Angle Strip, 2½″ × ½″	200.	Curved Plate, 1$\frac{11}{16}$″ radius
90a.	2½″ Curved Strip, cranked, 1⅝″ radius	212.	Rod and Strip Connector
109.	Face Plate	215.	Formed Slotted Strip, 3″
125.	Reversed Angle Bracket, ½″	216.	Cylinder, 2½″
		217a.	Disc, 1¼″

Model-Building Competition Results

By "Spanner"

August "General" Competition (Overseas Section)

The prizes offered for the most interesting and best constructed models entered in the Overseas Section of the "August" General Model-Building Competition have been awarded as follows:

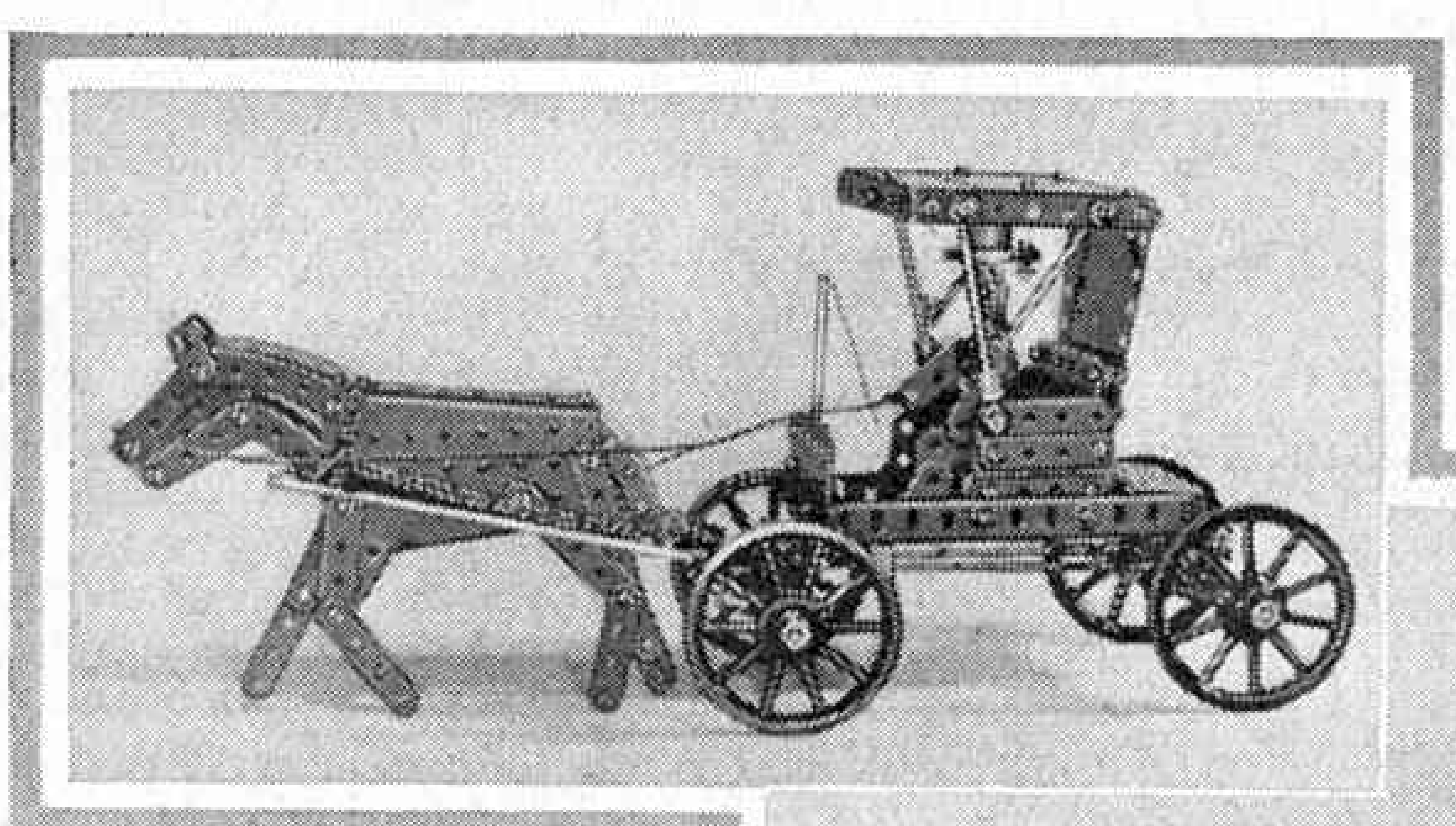
1st Prize, Meccano or Hornby products value £3/3/–: M. Malchow, Stavely, Alberta. 2nd, products value £2/2/–: A. Butcher, Christchurch, New Zealand. 3rd, products value £1/1/–: Nurullhasan A. Haji Gulamhoosen Cassumbhoy, Janjira Murud, India.

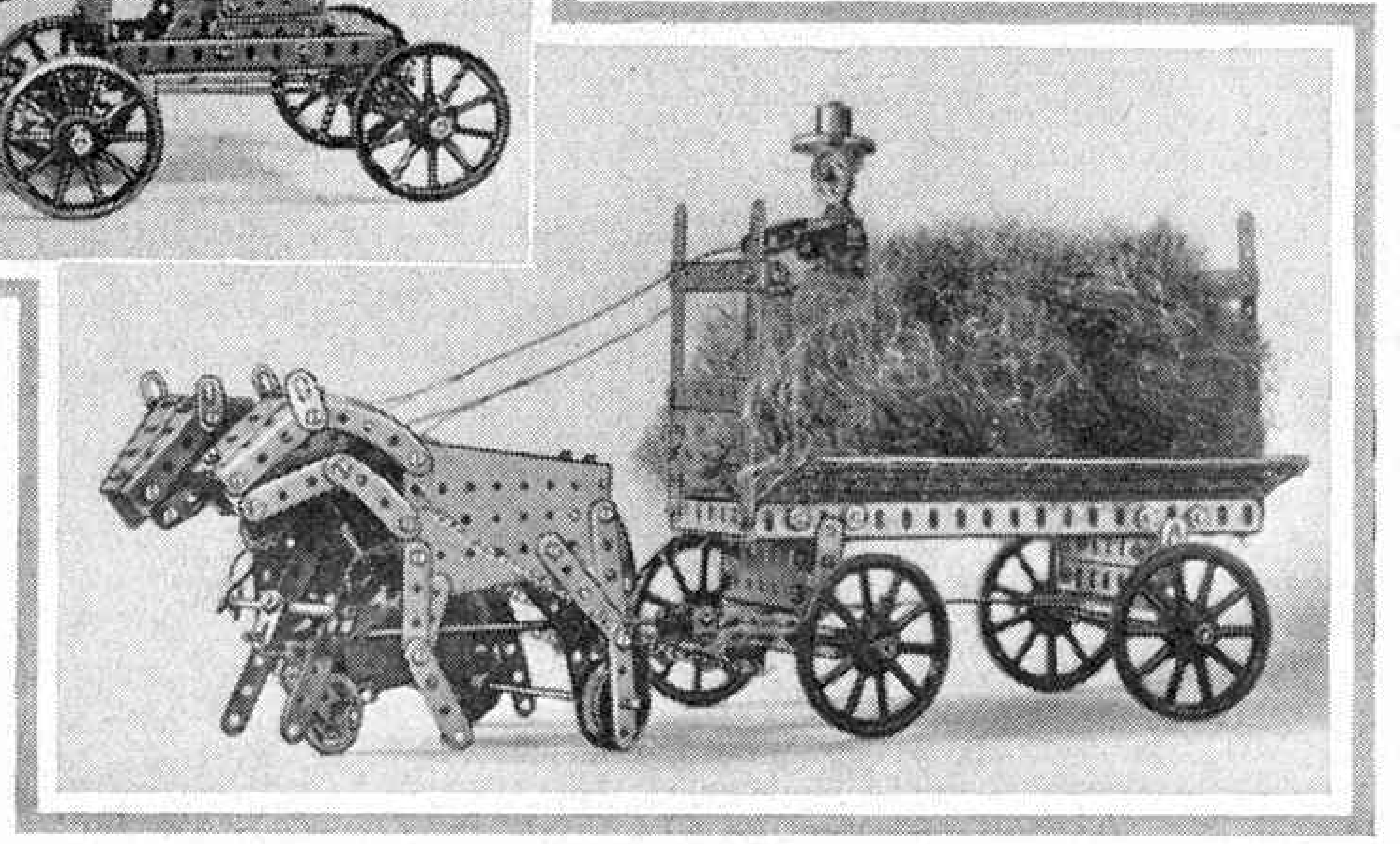
Products value 10/6: E. Bourgault, T'ao-Nan, Manchoukuo; H. Degenhardt, Amsterdam; A.F.v.d. Hoven, Amsterdam; C. Beese, Hamilton, Ontario; J. Sultana, Valletta, Malta.

Products value 5/–: K. and D. Eichel, Tel Aviv, Palestine; D. Greson, Ootacamund Nilgiris, S. India; P. Giese, Buenos Aires; J. Stutley, Leysin, Switzerland; B. Eyles, Natal, S. Africa.

This competition was remarkable for the many excellent models of various kinds of agricultural machines entered. Several of these were awarded prizes, and the two principal prizes actually were won by models of this kind, both representing reapers. A Canadian competitor, M. Malchow, Alberta, won First Prize with a model of a harvester thresher or combine machine, and the Second Prize was won by A. V. Butcher, Christchurch, New Zealand, who sent in a model of a reaper and binder.

The first prize-winning effort is a working replica, part for part, of the combine used on the Malchow farm in Alberta. It is driven by an electric motor, and is made capable of real cutting and threshing work by the use of card or paper to close openings as necessary.





The buggy and horse shown above and the hayrick and team on the right are two of three fine models submitted by Carl W. Beese, Hamilton, Ontario, a prize-winner in the "August" General Competition. They are remarkable for the realistic effect obtained with a few parts.

A van-like body houses the threshing machinery, and from one side of it extends a long arm which carries the knife and a conveyor. The arm is hinged so that it can be raised to allow the machine to pass through gates. The knife is represented by Rack Strips, and the conveyor by a length of flannel, to which strips of wood are sewn.

Inside the thresher the corn is first thrown into a cylinder, where it is rubbed by revolving Strips against a sieve. This process separates the grain from the straw, the former falling through the sieve, while the straw is ejected at the other side of the cylinder on to "straw racks." These are represented by Angle Girders to which are bolted strips of tin with sharp serrated edges, and they oscillate backwards and forwards, tearing the straw to pieces so that any remaining grains of corn are extracted.

The original of A. V. Butcher's model cuts corn and binds it into sheaves but does not thresh it. The model reproduces the movements of the actual machine very closely, but does not contain so much intricate detail work as Malchow's entry and therefore is less interesting.

Third Prize was awarded to N. A. H. Cassumbhoy, India. This competitor is only 12 years of age, and he submitted a remarkable working model mill, which does him great credit. The model was on exhibition for some time in the showroom of a large stores in Bombay.

Another Canadian competitor, Carl W. Beese, Ontario, sent a group of three models, two of which are illustrated on this page. They are a hay cart, a farm wagon and a buggy. Of these the buggy is the most ingenious, as it is constructed in a most realistic manner from only a few parts. For pulling either the hay cart or the farm wagon, Beese built up a pair of horses mounted on wheels and driven by a *Magic* Motor. The animals look astonishingly lifelike when harnessed to the wagons, as our illustration shows.

Boys of the Catholic Mission at T'ao-Nan, Manchoukuo, have won several prizes in recent competitions and in the "August" Competition they were again successful with a model of a winnowing machine used at the Mission for separating grains of wheat from the chaff. The wheat is fed into a revolving cylindrical sieve containing a quantity of stones. The rubbing action of the stones separates the wheat from the chaff, and the latter passes out through the holes in the sides of the cylinder. With the illustration of the model was sent a photograph of the original machine, and comparison of the two shows that every essential detail has been copied as closely as possible. The boys of the Mission submitted also a good model of the Mount Royal Cross at Montreal, Canada.

J. Sultana, Valletta, sent several models, the most interesting of which are an aircraft carrier and a battle cruiser. The aircraft carrier especially is a good example of skilful and intelligent use of Strips, and great attention has been given to the inclusion of all the more important details of an actual vessel of this kind.

One of the smaller prizes was awarded to Pablo Giese, Buenos Aires, for a model of the Dover-Dunkerque train ferry steamer "*Twickenham Ferry.*" The model is one of the best of this type that I have seen for some time, and looks particularly well in one photograph that shows it ploughing its way through a "sea" consisting of sheets of black and white material skilfully arranged and illuminated. The train-deck of the steamer is fitted with four tracks, which converge into two tracks at the stern, while on the upper deck there is a garage for motor vehicles. These are reproduced excellently in the model, and good use is made of Hornby Trains and Dinky Toys cars and miniature figures placed in appropriate positions.

A model of a swivelling jib crane was sent by J. Stutley, Switzerland. It is capable of lifting a weight of 11 lbs. and is driven by an Electric Motor through a four-speed gear-box. The crane is adaptable for use as a dragline if required.

Third "Lynx Eye" Contest Results

The principal prize-winners in the Home and Overseas Sections of the Third "Lynx Eye" Competition are as follows:

Home Section

1st Prize, Meccano or Hornby products value £2/2/–: E. Hooper, Exeter. 2nd, products value £1/1/–: F. Lennox, Gateshead. 3rd, products value 10/6: G. Johnston, Southall.

Overseas Section

1st Prize, Meccano or Hornby products value £2/2/–: D. Murison, Buenos Aires. 2nd, products value £1/1/–: A. Mehta, Simla, India. 3rd, products value 10/6: A. Dionne, Montreal.

Novel "Short Story" Contest Results

The prizes offered for humorous stories incorporating the names of Meccano parts have been awarded to the competitors named in the following list.

1st Prize, Meccano or Hornby products value £2/2/–: R. Symons, Plymouth. 2nd, products value £1/1/–: K. Bakker, Sea Point, S. Africa. 3rd, products value 10/6: W. Whitaker, Hornsea, E. Yorks.

Settling Down

Officials and members are now settling down to the work of the second Winter Session. This is the period of the year when interest in model-building is greatest, partly because of the influx of new members, and partly owing to the acquisition by those already associated with the club of new parts or Outfits that spur them on to more ambitious model-building efforts.

No effort should be spared to turn the increase in interest to good account. This may be done by organising competitions of some kind. Members may be asked simply to submit models of their own design and choice of subject, or "Simplicity" contests or other special competitions may be arranged. A plan that is followed with great success by some clubs is to arrange a series of contests, say fortnightly, in each of which members are required to build a special type of model. In one of such a series a motor lorry may be the subject; in another ship models may be called for, and a third may be devoted to cranes of some kind.

Whatever the type of contest, either comparatively simple models may be built in the limited time available at club meetings, or members may be encouraged to construct more elaborate models at home, and to bring them to meetings for judging and comment. Points should be awarded in each contest of the series, and the members whose scores at the close are the highest can be awarded small prizes.

A second way of turning to the best account the prevailing interest in model-building is to encourage the preparation of entries for Exhibitions or Open Nights at the end of the Session, that is about Easter. Members may be asked to build one good working model, or to construct a group of models, and these should be regarded as entries in special Exhibition Model-building Contests.

Looking after Newcomers

In judging the models, whatever form of contest is adopted, age and resources should be taken into account, so that no member is handicapped by lack of opportunity. In particular, new members should be given special consideration, preferably by arranging a special class for them. Most of those who join at this time of the year are young boys, some perhaps with little or no experience of model-building, and it is scarcely fair to plunge them into direct rivalry with more experienced members. In many clubs a special section is formed for beginners, who are placed under the guidance of an experienced assistant leader. This helps them to find their feet in club life, and is productive of excellent results in the long-run.

It is from the juniors of to-day that the officials and section leaders of to-morrow are recruited, and the really successful club is the one that looks to the welfare of its younger members. Clubs in which little or no attention is paid to the needs of newcomers cannot possibly have a long life.

Meccano Club Leaders

No. 93. Mr. P. V. Bates

Mr. P. V. Bates is Leader of the Royds Hall Grammar School (Huddersfield) M.C. This club was affiliated to the Guild in October of last year, but already has 33 members, and further applications for membership were received at a very successful Exhibition held recently.

Sporting Contests for Club Meetings

Contests with a sporting element in them are always popular with boys, and would be specially useful at this period. Perhaps the best type would be concerned with models of racing motor cars. These can actually be raced, and in judging them points should be awarded not only for ingenuity and neatness in construction, but also for speed and ability to maintain a set course, either straight or curved.

A competition of this kind is great fun, provided there is a reasonable floor space on which to arrange the speed trials. Clockwork motors are the most suitable power units, and different classes may be arranged according to the size and power of the motor fitted, exactly as is done with real racing motor cars and cycles, which are classified according to engine capacity. It is probably best to run off the trials in heats of only two competitors, and thus to carry on the trials as knock-out contests. Such competitions give rise to much fun and great excitement.

Merit Medallions in 1938

Last month I gave the names of members of Meccano clubs to whom Merit Medallions were awarded during 1937. The list is a good one, and to all who won this reward, the highest open to Meccano boys, I give my heartiest congratulations.

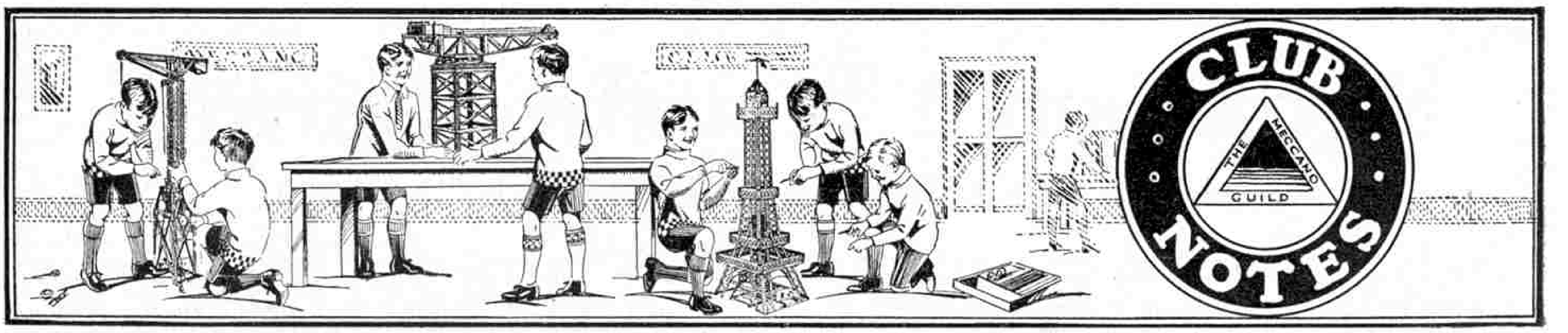
A notable feature of the list is the proportion of Overseas club members who have earned Merit Medallions. The wide distribution of these awards also is very satisfactory, but I do not think sufficient use is made of them, as many clubs are not well represented in my annual lists.

I hope that Leaders will keep in mind the existence of this award and will use it to recognise special good work of any kind by members. In each club two Medallions are available for each of the four Sessions into which the Meccano club year is divided, and the Leader's nomination is all that is required. I shall look forward to a record year during 1938 for Merit Medallion awards.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters, whose names and addresses are given below:

AMERSHAM—G. Villiers, Ridgewell House, Little Missenden, Amersham.
BEARSTED—R. McKeough, Ware Street, Bearsted, Nr. Maidstone.
CANADA—J. Loube, 73, Darling Street, Brantford, Ontario, Canada.
DARLINGTON—H. Dobinson, 74, Park Lane, Darlington.
ELLESMERE—R. Davies, 12, Watergate Street, Ellesmere, Salop.
EGYPT—Miss Z. K. Zada, c/o Mr. Y. K. Zada, Zagazig Secondary School, Zagazig, Egypt.
MIDDLETON JUNCTION—F. Radcliffe, 178, Grimshaw Lane, Middleton Junction, Nr. Manchester.



St. James' (Grimsby) M.C.—Members have constructed a giant blocksetting crane, the Meccanograph and a large model of a Grimsby Corporation trolley bus for exhibition at the Parish Church Bazaar, which was held in the Town Hall. These models also were shown at the Model Engineers' Exhibition. Club roll: 11. *Secretary:* P. Jackson, 99, St. Peter's Avenue, Cleethorpes, Lincs.

St. Oswald's M.C.—The recent Exhibition was a great success, both from a financial and a spectacular point of view. Visitors showed great interest in the Ship Coaler and Twin Beam Engine demonstration models on loan from Headquarters, and also in the various other models constructed by members of the club. An additional attraction was a Cinematograph Show that lasted half an hour. It is hoped to hold a further Exhibition in April, and then to make it an annual affair. Since the Exhibition a new club room has been secured. As this is much larger and more suitable for club activities, there is room for more members, and anyone interested is requested to communicate with the secretary. Club roll: 30. *Secretary:* J. Jaques, 5, Ingram Road, Thornton Heath, Surrey.

A group of members of the Winchmore Hill Collegiate School M.C., Leader, Mr. K. Appleby; secretary, J. H. Piejus, who is the fifth figure from the left. Our photograph shows models built by members and part of the Hornby Railway operated at the club's recent Exhibition, which was a great success.

St. Stephens (Saltash) M.C.—The club's Exhibition was very successful, and resulted in club funds being considerably increased. Members of the Meccano and Hornby Sections worked together in operating the Branch track. A Workshop, a Wagon and various aeroplane models were among the attractive exhibits, and a Ship Coaler demonstration model on loan from Headquarters was greatly admired. Games Evenings are a popular feature of club proceedings. Miss J. Porter has kindly accepted the Presidency of the club. Club roll: 6. *Secretary:* S. Braund, 9, Homer Road, Saltash.

Sid Vale M.C.—The Table Tennis Tournament was won by D. Holland, who was presented with the "Hodder Cup," kindly given by Mr. M. C. Hodder, Leader of the Exeter M.C. A Recruiting Party was held, at which tea was provided and a display of attractive working Meccano models given. Games were played, and music was supplied by means of a radiogram. The club cups were presented to the members whose work during the previous session had earned these awards. At other meetings racing car, tractor, lorry, ship and crane contests attracted a large number of models. A Model Carnival, which was open to the public, was very successful, and half the proceedings went towards the Local Carnival Funds. Club roll: 25. *Secretary:* L. R. I. Gliddon, Sheffield House, Sidmouth.

Sutton Valence M.C.—Weekly Contests have proved of considerable interest, and these have attracted a number of excellent and amusing models, one reproducing a group of street musicians causing a great deal of merriment. Football is as popular as ever. A "Market Night," when articles of every description were either given away, sold or exchanged, was a great success, the proceeds going towards club funds. The new club Trophy is to take the form of an electric lamp, with bulb representing a rabbit, thus being a symbol of outdoor activities and mechanical activities. Club roll: 21. *Secretary:* C. Austin, East Sutton Park Lodge, Sutton Valence, Kent.

Barnard Castle School M.C.—The Exhibition held recently was very successful, the Hornby Section contributing a large track in full operation, and the Meccano Section displaying excellent models. Indoor games have been introduced, to be played when members of either section cannot find room for their activities. J. O. Carse is now secretary of both the Meccano club and the H.R.C. Branch, the former secretary having resigned, although still taking an active part in club proceedings. Club roll: 11. *Secretary:* J. O. Carse, The School, Barnard Castle.

Burnley Grammar School M.C.—Activities are carried on with increased enthusiasm, several keen new members having joined the club. Competitions of various kinds have been the main feature of the programme, and some excellent models of both an original and useful character were the result. Members of the club have been busy for many weeks preparing a model for display at a Peace Exhibition to be held in the town. This model consists of a wireless transmitting station, with a Peace slogan displayed between the pylons. Lamps and buzzers add to the effectiveness of the model. Club roll: 25. *Secretary:* J. Harrison, 5, Arbories Avenue, Padiham, Burnley.

Middlesbrough M.C.—A new committee has been elected, G. Brockhurst now taking the position of secretary. The Christmas Party was held on 18th December, and was thoroughly enjoyed. A Parents' Whist Drive took place on January 5th, and this was very successful. Club roll: 20. *Secretary:* G. Brockhurst, 49, Heythrop Drive, Acklam, Middlesbrough.

Morison Memorial M.C.—The club is making good progress. There are now five sections, for Meccano, Woodwork, Aeroplanes, Model-building and Stamp Collecting respectively, and all are very popular. Members of the Meccano Section have been busy constructing an overhead railway. A Hornby Night proved to be enjoyable. Club roll: 35. *Secretary:* A. McDougall, 119, Dumbarton Road, Clydebank.

Old Charlton M.C.—Meetings have been many and varied, and Charades and Tricks have been greatly enjoyed. On one evening a murder was committed during progressive games, and this was followed by investigations by detectives and the trial of the murderer. Great excitement prevailed and everyone thoroughly enjoyed the plot. A talk given in October by Mr. Fish was continued during one meeting. "*The Meccanic,*" the club's magazine, is as lively and attractive as ever. It is edited and printed by Mr. F. W. Ambrose, Leader of the club. Club roll: 22. *Secretary:* K. Morphew, 221, Westcombe Hill, Blackheath, London, S.E.3.

Royds Hall Grammar School M.C.—The club's Exhibition held in December was very successful indeed. Members devoted considerable time to this event, and the result was seen in two well laid-out railways, one clockwork and the other electric, in addition to a large variety of working models, steam engines and model aeroplanes. A small broadcasting station proved an irresistible attraction to would-be crooners and announcers! Membership is steadily increasing, and the Exhibition resulted in further applications for membership of the club. Club roll: 33. *Secretary:* D. Livesey, Royds Hall Grammar School, Huddersfield.

Stretford Public Libraries M.C.—Excellent progress is being made in the club, and fine models of all descriptions have been constructed by members. It was decided to make scrap books containing pictures of aeroplanes, motors, motor cycles, ships and engines, and these various subjects were allotted to different boys, who undertook to collect the pictures. Members were very enthusiastic about a Lantern Lecture on "*Britain's Largest Railway,*" kindly loaned by the L.M.S., which was attended by 70 members and friends. The Stamp Club is still very popular, and further donations have been distributed among members. It has also been decided to keep a scrap book of odd pieces of information about stamps. Members volunteered to collect cuttings from newspapers and magazines on the subject, the Leader undertaking to mount and index them. Club roll: 34. *Secretary:* Miss F. Scattergood, Public Library, Technical Institute, Stretford Road, Old Trafford, Manchester 16.

Queen Elizabeth's Grammar School M.C.—This club held a very attractive display in connection with the School Society Hobbies Exhibition, at which many varied and attractive exhibits were on view. The Meccano Room was one of the most popular features of the event, and two demonstration models on loan from Headquarters were greatly admired. The Hornby Section also attracted many visitors. *Secretary:* R. I. E. Haynes, Queen Elizabeth's Grammar School, Barnet.

AUSTRALIA

Maylands M.C.—Each Faction presented a programme organised solely by its members. This was very interesting, and several new items were introduced, the Green and Gold Faction winning the competition. A special session has been held to commemorate Mr. Frank Hornby, the founder of the Guild, the main feature being a Play dealing with the history of Meccano. Every member took part in this, and it proved a great success. Several visits of interest were paid during the holidays. Club roll: 32. *Secretary:* M. Thomson, 13, Kennedy Street, Maylands, Western Australia.

Melbourne M.C. — Members visited the Engineering School of the Melbourne University for its annual demonstration, at which an illustrated Lecture on the Yarrawonga Weir was given. Members also saw interesting exhibits in the electrical and mechanical engineering laboratories. A new Hornby 20-volt Locomotive, G.W.R., was unveiled and given its trial run. This brings the number of Hornby 20-volt locomotives in service to three. A visit was also paid to the Train Control Rooms of the Victorian Government Railways, and the members saw how the movements of trains were recorded on graphs. Club roll: 10. *Secretary:* L. Ison, 8, Hayes Street, Northcote, N.16, Victoria, Australia.

EGYPT

Cairo M.C.—Excellent progress is being made, and meetings have been well attended. Visits of historical interest have been paid by the members of the club to the Temples and other ancient monuments at Luxor, Upper Egypt, and to the Roman Museum at Alexandria. Model-building and Stamp Collecting are the chief activities of the club. A special Christmas meeting was held, to which people of importance were invited to enable them to inspect the work carried on by the club. Merit Medallions earned by members also were presented at this event. Club roll: 30. *Secretary:* S. F. Awad, 7, Atfet El Zawia, Haret El Gameh, Shoubra, Cairo, Egypt.

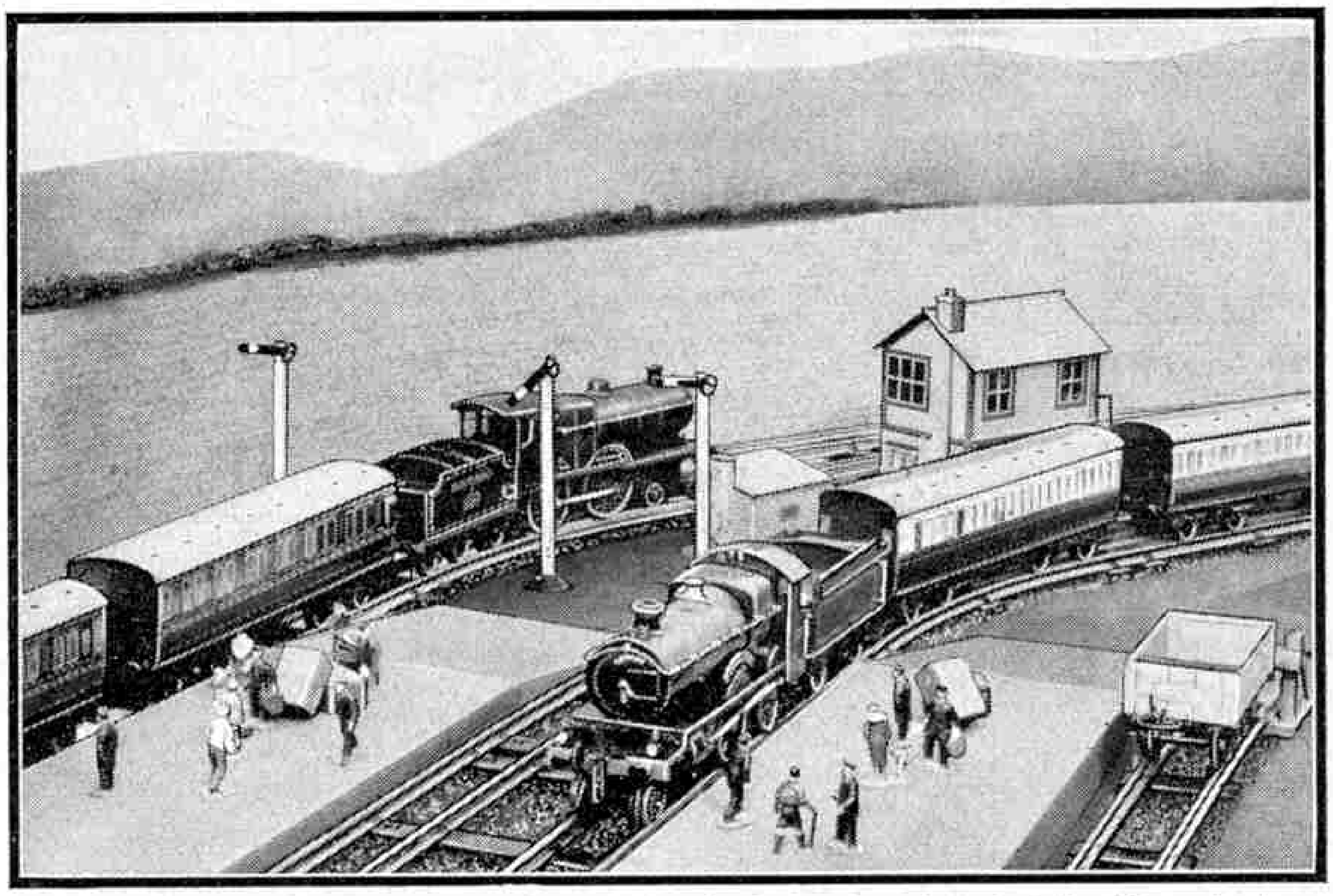
NEW ZEALAND

Christchurch M.C.—One of the most enjoyable meetings was devoted to a talk on South Africa given by Mr. Emerson, who served in that country for several years as a Police Sergeant, and consequently was able to give first-hand information and tell thrilling stories of his experiences. One of the members provided supper in honour of his birthday, and also produced a splendid cake decorated with the name of the club and the Guild badge in icing. The guest of honour for the evening was the secretary of the Ashburton M.C. who was spending the week-end in Christchurch. Other recent meetings included a display of movie films, and a visit to the Ashburton M.C. for its Annual Birthday Social. Club roll: 41. *Secretary:* L. P. Chapman, 24, Braddon Street, Christchurch, S.W.1, New Zealand.

Signals on a Hornby Railway

Correct Working on a Miniature Layout

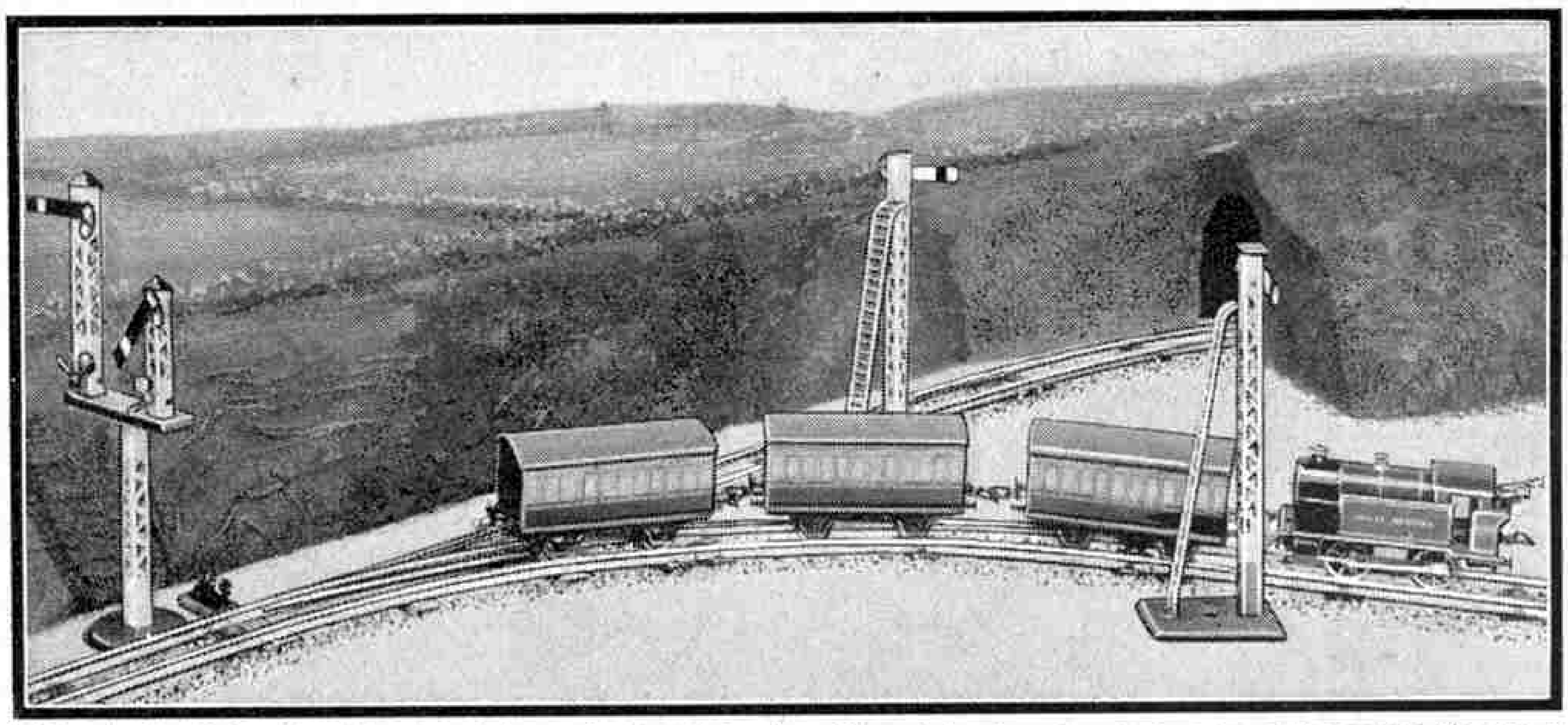
SIGNALS are not necessary on a miniature railway, in the sense that they are not required for the safe working of trains, but unless the layout is to look very incomplete a certain number of them must be used. Even a few signals give an appearance of realism to a layout, and it is most interesting to operate them as nearly as possible on the lines of actual practice. This article deals with the signals of the Hornby System, and gives some suggestions for their use.



Hornby "M" Series Signals in use as platform starting signals at a busy through station. These signals are particularly suitable where the inclusion of several of the larger type would overcrowd the scene.

Each of the various types of signal in the Hornby Series is made in three patterns, described as No. 1, No. 2, and No. 2E respectively. The No. 1 Signals are the simplest and are quite realistic, although they lack some of the detail of those of the No. 2 type, which include a dummy lamp attached to the post and a ladder for the use of the "lamp-man." The semaphores of the No. 2 Signals also are of improved construction as compared with those of the No. 1 pattern. They have transparent "spectacles" mounted in a frame of the correct type instead of solid tinprinted ones. The semaphores of the No. 2E Signals are more elaborate, for they are fitted for electric lighting in addition to having the details standard on the No. 2 pattern.

On real railways the normal main line signals are divided into two main types, namely "home" and "distant." Both types are included in the Hornby Range, and the details of the real signals are correctly followed in the miniatures.



A Hornby No. 1 Junction Signal used for controlling trains for either of the two diverging routes at the points. The No. 2 single-arm "home" Signals govern the movements of trains in the opposite direction.

A "home" signal is placed at every point requiring protection, such as junctions and sidings, crossings, and at stations. Its semaphore has a plain square end, and when this is in its normal position the signal must not be passed by a train. On the side that faces an approaching train the semaphore is painted red, and it has a plain vertical white stripe at a short distance from its outer end. At night a red light is displayed when the arm is in the "danger" position, and a green light tells the driver that the line is "clear."

The "distant" signal is placed from 600 to 1,000 yards in front of the "home" signal, and is intended as a warning to the driver, as the position of its arm corresponds with that of the "home" signal that it precedes. Thus the driver has ample warning if the "home" signal is at danger, and he can easily bring his train to a standstill if necessary.

To permit "distant" signals to be recognised their semaphores have fishtailed notches cut in their outer ends. In modern practice the semaphore of a distant signal facing the train is painted yellow, with a black stripe parallel to the fishtailed end. At night "distant" signals now display an orange light for "caution," and this makes them quite distinct from the "home" signals. A green light is used to show "line clear" for both types.

Besides the plain signals of "home" and "distant" types, others of special construction are included in the Hornby Series. One of the most interesting of these is the Double-Arm Signal, which carries a "home" semaphore at the top of the post, and a "distant" arm below it. These signals are used in practice where the section ahead is so short that the "distant" signal applying to the next "home" signal could not be placed in its correct position. It is therefore mounted on the same post as the preceding "home" semaphore. If the latter only shows "line clear" a stop is likely at the next "home" signal, but if both the semaphores show "line clear" the next "home" signal also will be in this position. A point that Hornby Railway owners should bear in mind is that the "distant" semaphore must never show "line clear" when the "home" arm on the same post is at "danger."

Divergences from the main route are indicated by junction signals. Hornby Junction Signals have two semaphores, placed side by side on one main post with the semaphore for the main line on a taller post than that for the branch. Sometimes such a signal is preceded by a single distant, and on some routes complete "splitting" or junction distants are provided.

A signal gantry is a structure spanning the track on which several short signal posts are mounted, and is used where there are several lines or divergences to be signalled. The Hornby Signal Gantries have four signal posts mounted on the actual gantry portion and is not only useful but a handsome and realistic addition to a Hornby Railway.

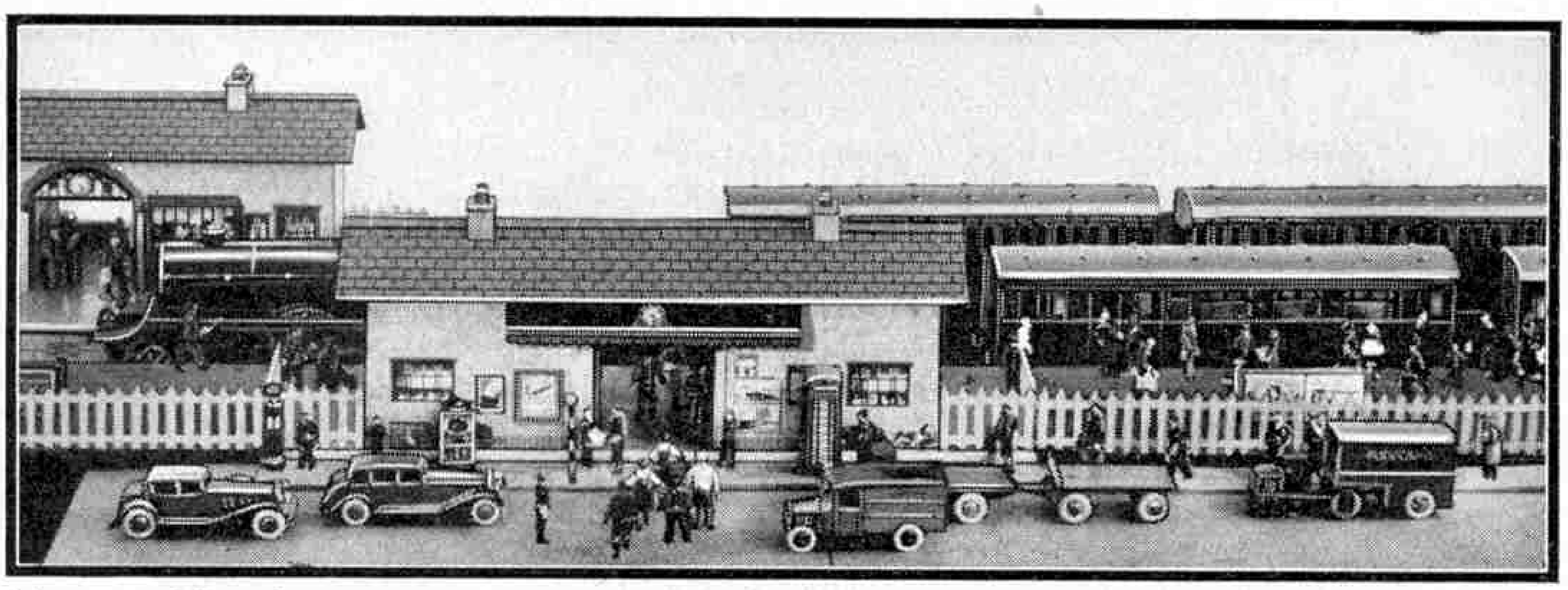
In addition to the No. 1, No. 2 and No. 2E Signals there are those of the M Series. These are smaller and of simpler design, and are suitable for the smallest types of layouts but can also be used as platform starting signals or for sidings on larger layouts.

Stations in the Hornby Series

By "Tommy Dodd"

STATIONS are necessary on any miniature railway system if the line is to provide passenger and goods transport for the district through which it runs. Without any station at all a layout has no apparent purpose. There is nowhere for the trains to start from and nowhere to stop at!

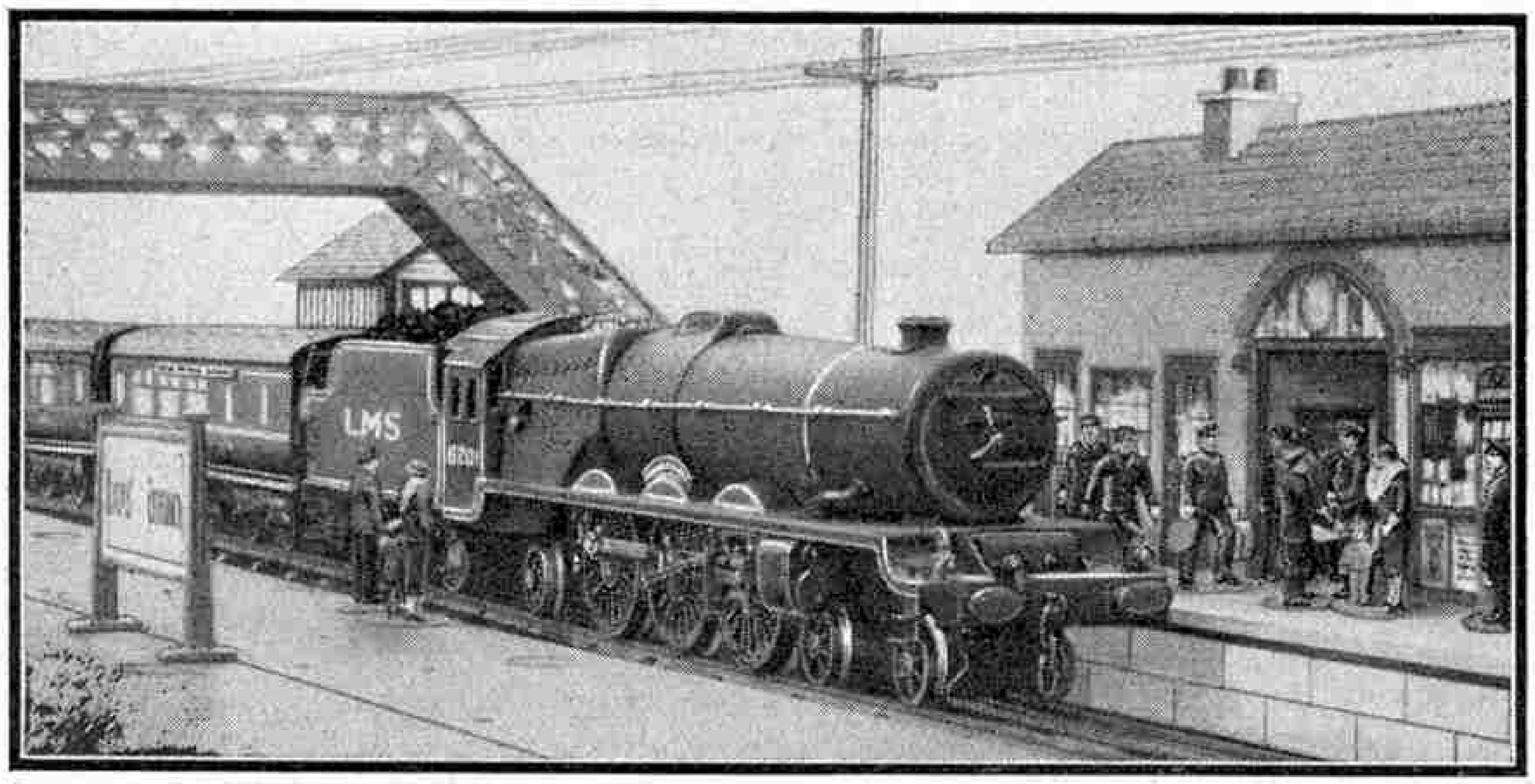
On a Hornby railway system the provision of stations is an easy matter, for several interesting models of this kind are available. Readers are probably familiar with the No. 1 and No. 2 types of station, but in order to appreciate fully the improved No. 3 and No. 4 types that have recently become available it will be as well to run over the chief points in the design of the older models.



A busy scene at the station on a Hornby Railway. The "roadway" is raised to bring it almost up to platform height. The centre section of the No. 4 Station is extended by means of standard Passenger Platforms.

The No. 1 and No. 2 Stations generally are similar in design, the differences between them being that the No. 2 Station has a ramp at each end, with paled fencing, and its station buildings are provided with chimneys. These features are not included in the No. 1 Station. The buildings of both are attractive, showing details of dining rooms, waiting rooms, the booking hall and other station features, with a typical railway clock over the entrance. A particularly realistic bookstall is shown.

The No. 2 Station is more imposing, for its ramps and the paled fencing at the back of the platform give it a realistic and railway-like appearance. Station Name Boards are fitted on the fencing, and the Hornby Railway owner can have a station with a name to suit his line, whatever railway it represents, as he has the choice of Wembley (L.M.S.), Reading (G.W.R. and S.R.), Ripon (L.N.E.R.) and Margate (S.R.).



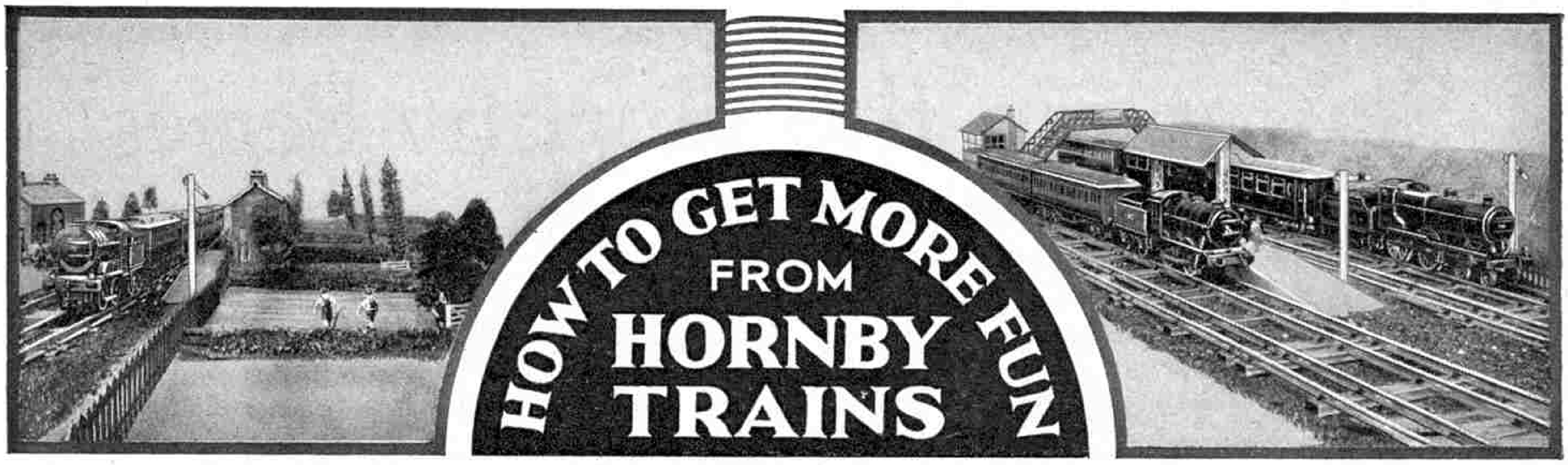
The arrival of an express. "Princess Elizabeth" on a train of L.M.S. Corridor Coaches coming alongside the platform of one of the new No. 4 Stations described in this article.

Of the new stations the No. 3 model is of the same general style as the No. 1, but the "brick" building of the older model is replaced by a structure with a more modern style of finish. The usual offices are included, and the building generally is of light and pleasing appearance. An improvement that has been effected to the platform itself is that it is now finished by the tinprinting process instead of the enamel. Concrete blocks are represented on the front and back faces, and the top of the platform is finished to represent a special surface.

Similar improvements have been effected in the new No. 4 Railway Station, which corresponds to the old No. 2 model in consisting of the main centre section with the building upon it and two end ramps. Paled fencing of the usual type also is provided and the selection of names available is the same. A most interesting change is the provision of an actual opening through the centre of the station building to form an entrance and booking hall. This hall is finished in the same general style as the rest of the building, and the ticket window is finished to represent the modern glass-fronted type. A particularly attractive fitting is the provision of a miniature barrier in front of the ticket window. This immediately gives the correct "station" atmosphere, particularly if one or two Dinky Toys figures are arranged round about it as if waiting to obtain their tickets.

The finish of the platform and ramps, and of the building itself, is similar to that of the new No. 3 Station described previously. The tinprinted details of the building are extremely attractive. The modern "rough-cast" style is represented, with tiles round the base of the walls and over the arched entrance to the booking hall from the platform side. Windows and doors are neat and attractive and the well-stocked bookstall has a very natural appearance. The smallest details are included, even to a bundle of excursion bills hanging from the small counter of the ticket window.

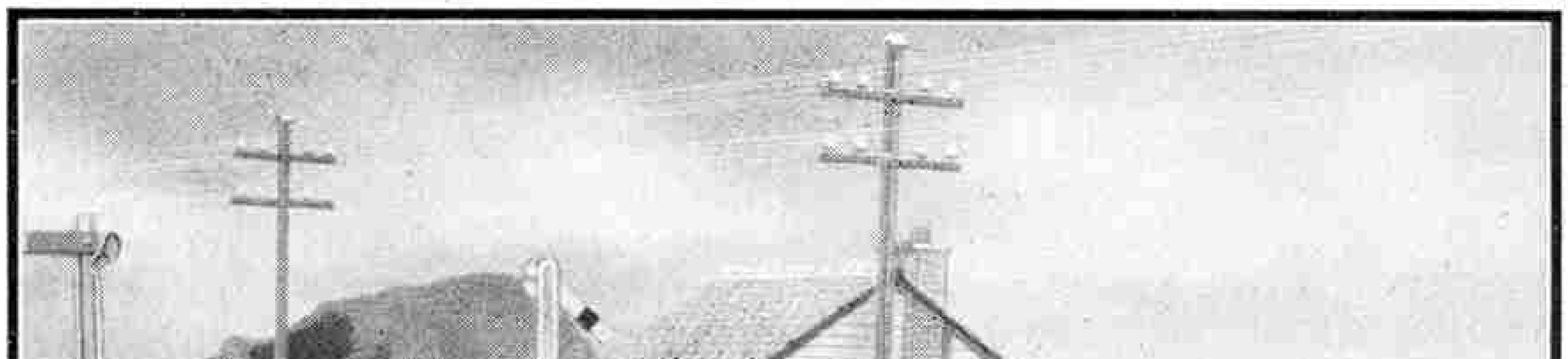
The No. 4E Station is of the same design and finish as the No. 4 model, but is wired for electric lighting and is fitted with two lamp-holders.



HOW TO GET MORE FUN FROM HORNBY TRAINS

FAST FREIGHT TRAINS IN MINIATURE

THERE is a tendency among miniature railway owners to concentrate their attention almost entirely on the running of passenger trains, and to neglect the less spectacular but very necessary goods trains. A great amount of fun can be obtained in the operation of goods trains, however, and especially of those run for the conveyance of particular traffics. The development of special services, the general speeding up of freight trains and the many different types of vehicles now in use for different purposes all combine to make modern goods traffic working very interesting.



An express fish train on a Hornby G.W.R. layout. The train is made up of No. O G.W.R. Fish Vans and is hauled by an E220 "County of Bedford" Locomotive.

The Hornby System contains a very interesting variety of vehicles that make possible the operation of many different types of freight trains. The carriage of foodstuffs is a most important part of railway work and freight flyers carrying perishable traffic of this kind are operated between producing areas or ports and market centres. Of the various vehicles suitable for such trains that have recently been introduced into the Hornby range, the No. O Fish Vans are important. Fish is perhaps the most perishable of freights carried by rail, and has to be handled with the utmost speed. The accompanying photograph shows a miniature G.W.R. fast fish train composed of the appropriate fish vans, or *"Bloaters"* as they are termed on the G.W.R. Such vehicles are usually reserved for their own special kind of traffic and the Hornby models are boldly marked *"For Fish Traffic Only."*

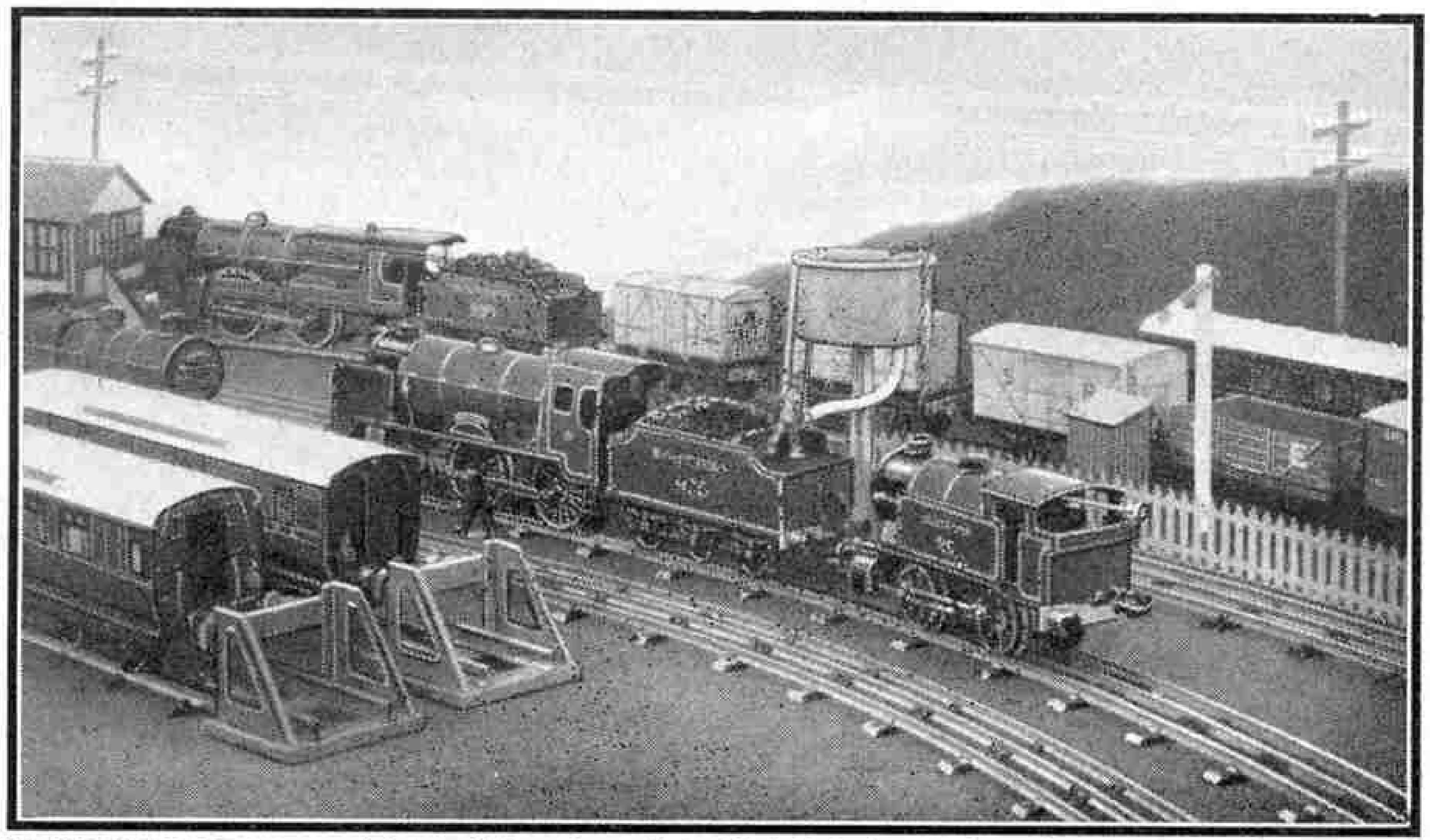
Miniature fish trains can be worked into the schedules of a Hornby railway system as convenient. This will represent quite well the state of affairs in actual practice, for the running and loading of fish trains depends entirely on the arrival of trawlers at ports and the extent of the catch. For this reason it is important that fish vans should be available in sufficient numbers for any heavy catch that may have to be dealt with. The Hornby G.W.R. Fish Vans are therefore lettered with the instruction *"Return immediately to Cardiff,"* as are many G.W.R. fish vans in actual practice. Cardiff is an important centre for G.W.R. fish traffic, and the running of a train of Hornby Fish Vans will be an interesting part of the operation on any miniature system representing the G.W.R. The running of the corresponding "returning empties" should not be neglected.

For locomotive power most G.W.R. operators will prefer to use either the E320 "Castle" or E220 "County" class engines. On smaller layouts the E120 Special Locomotive may be preferred, and its mixed-traffic character makes it very suitable for representing the "Hall" and the newer "Grange" class engines commonly employed on such duties in actual practice.

On several occasions recently we have referred to the uses of the L.M.S. Fish Van, especially in connection with the well-known *"1.55 p.m. Fish"* from Aberdeen. This is a fast freight train that has the distinction of being handled by a passenger locomotive from Aberdeen as far as Carlisle. Often a "Royal Scot" is used, and frequently even a "Princess" 4-6-2 is to be seen on this train. An illustration showing the train in miniature with the Hornby *"Princess Elizabeth"* in charge appeared on page 52 of the *"M.M."* last month.

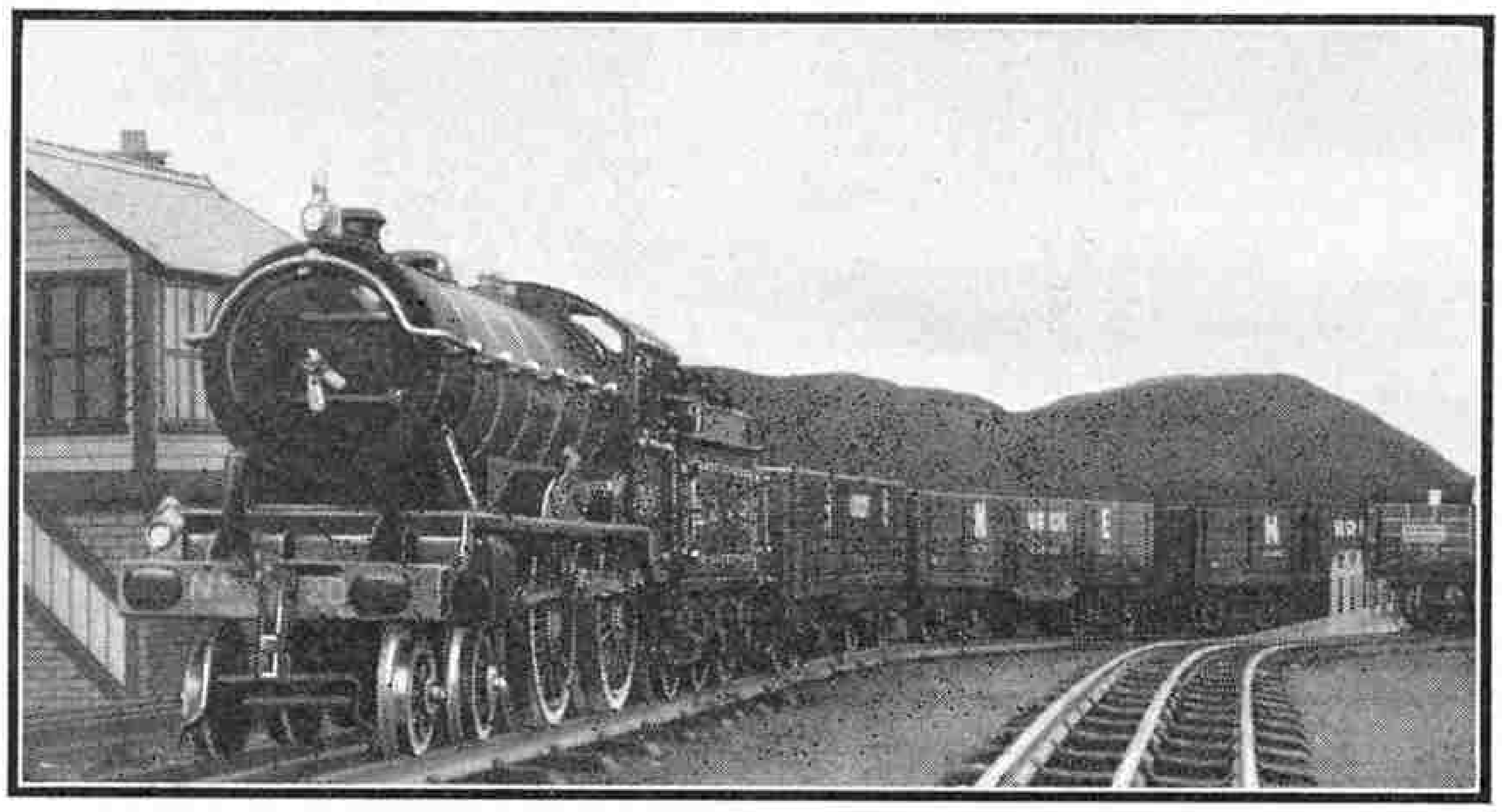
Long-distance fish trains are a feature of L.N.E.R. practice. A notable example is that originated at Mallaig, in the West Highlands, from which point it covers 597 miles in the course of its journey up to London. For the first part of its journey it runs over the difficult West Highland route, much of it single line, that was described by "Railway Engineer" in the article *"The Skye Boat Express"* on pages 4 and 5 of last month's *"M.M."* The Mallaig fish train would be interesting to reproduce. A variety of Hornby Locomotives could be employed on it. Thus an E120 Special could be used to represent the "K2" class "Moguls" that perform a great deal of the work on the West Highland line. An E220 "Hunt" class engine would be suitable for the "North Eastern Area" of the miniature system, while over the "Southern Area" an E320 4-4-2 engine could well be employed.

The trains so far dealt with carry bulk consignments over long distances. Smaller loads, possibly consisting of only one or two vans, are often attached to passenger trains. This is a plan that will appeal to many Hornby railway owners, as it adds considerably to the interest of station operations if the vehicles have to be attached at a particular stopping point, and then forwarded to their destination. This method is especially suitable on smaller layouts, where only a limited number of different items of rolling stock is available.



An interesting scene on a miniature S.R. system. A fast freight train carrying miscellaneous traffic and hauled by an E320 "Lord Nelson" is passing the locomotive and carriage sidings in the foreground.

Container traffic is a feature of modern train operation, and Hornby Containers and Flat Trucks can be used very effectively in conjunction with other items of freight stock in the assembly in miniature of trains representing many notable freight flyers of actual practice. For instance, there is the L.N.E.R. *"3.40 p.m. Scottish Braked Goods."* This provides a rapid service between London, intermediate stations and Scotland, and has long been one of the fastest freight trains in the world. In making up this *"3.40 Scotsman"* on a Hornby railway L.N.E.R. Containers and Flat Trucks will be necessary. The rest of the train can consist of various other vans, perhaps with one or two ordinary wagons carrying loads protected by Hornby Wagon Tarpaulins. For locomotive power the engines considered in connection with the L.N.E.R. West Highland fish train would be appropriate also for the *"3.40 p.m."*



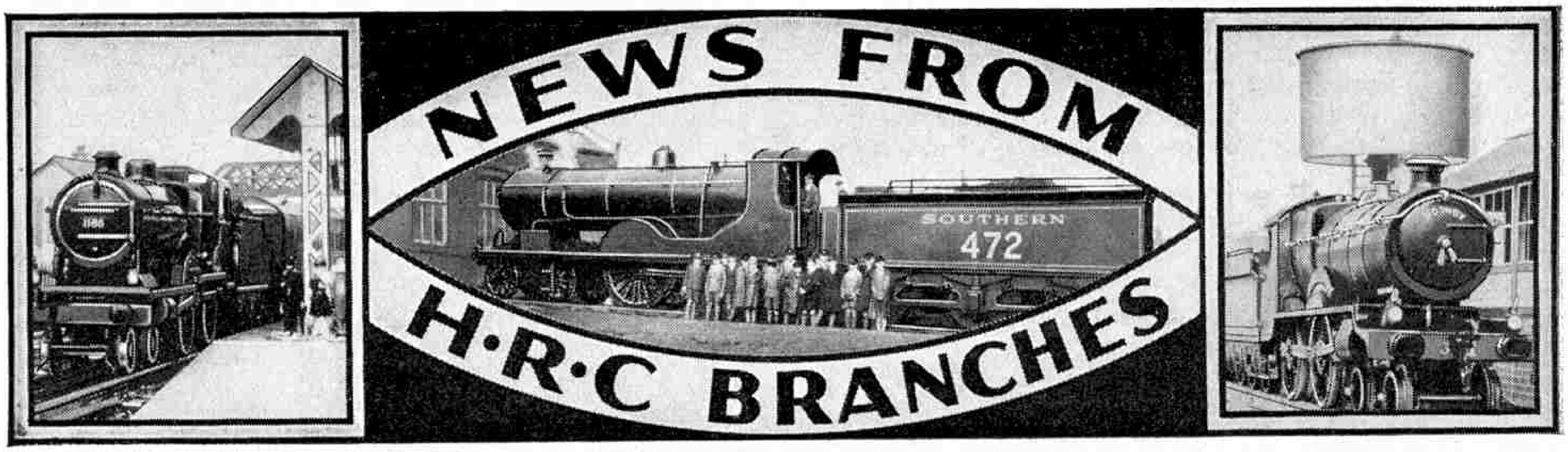
A Hornby "Brick Express"! This train of No. 2 High Capacity Brick Wagons, with "The Bramham Moor" Locomotive at its head, represents one of the express brick trains run on the L.N.E.R.

The corresponding up service on the L.N.E.R. is known as the *"3.55 Southerner"* from Glasgow. Among other L.N.E.R. freight services that have names given to them indicating the area they serve are the *"4.5 North Eastern"* and the *"6 o'clock West Riding,"* each from King's Cross.

An important S.R. freight train is the 7.38 p.m. from Exeter. This is familiarly known to the S.R. staff as *"The Market,"* as it is the chief train from the West of England for London market traffic. In the course of its assembly for the first part of its journey it receives traffic from numerous Western stations. It stops at Templecombe for East Devon connections, and at Salisbury, and then runs up to Nine Elms depot. Hornby S.R. Flat Trucks carrying Ventilated Containers will be very suitable for a miniature representation of this train, together with a few vans of different kinds. The most suitable types of engines to be used will be the E320 and No. 3C Locomotives in S.R. colours, these being used to represent the fast freight engines used in actual practice. Those who prefer to do so can use the latest S.R. model the 4-4-0 locomotive *"Eton,"* however, This will give a very modern touch to the proceedings, although normally "Schools" class engines do not take part in freight working.

The various bogie freight vehicles in the Hornby System are very suitable for fast goods working. Their loading capacity is high, and the fact that they are bogie vehicles makes them run easily and steadily, particularly those that are provided with die-cast wheels and axle-boxes. A very popular goods vehicle is the No. 2 High Capacity L.N.E.R. Brick Wagon. The real wagons were specially introduced in connection with the brick traffic conveyed by the L.N.E.R. from Peterborough and district to other parts of the system. An up brick express is in fact operated regularly from Peterborough. The lower photograph on this page shows a miniature representation of one of these trains. Boxes of miniature Bricks, an interesting addition to the Hornby range, add considerably to the fun that is to be obtained in operating these Wagons. They look most effective when loaded into the No. 2 L.N.E.R. Brick Wagon.

So far we have not mentioned the tail of the train, where that most important unit, the brake van, is to be found. In general the goods type of brake van is employed at the rear of fast freight trains, and for this purpose the well-known Hornby goods Brake Van is suitable. Sometimes it is possible to see a passenger type brake van at the rear of fast freight trains, however, and the increased comfort afforded by these vehicles is a great advantage for the goods guard. It would therefore be quite in order to employ such a van on a Hornby fast freight train. A No. 1 Passenger type of Guard's Van would be very suitable, and its appearance at the end of a train of vehicles of a distinctly "freight" character would lend a touch of the unusual to the operations on a miniature railway.



Branch News

Purley County School.—The programme has consisted mainly of track operations, both electric and clockwork trains being run. A Branch Library has been formed, and copies of the *"M.M."* covering the period 1929-1931 are included. Arrangements for each month include a Games Night, Saturday Morning Meetings and General Discussions, with occasional talks on topics of interest to be given by the Chairman or one of the members. Secretary: L. J. Vaizey, 26, Arundel Avenue, Sanderstead, Surrey.

Spring Grove Central School (Isleworth).—All meetings have been devoted to track operation, with the electrical side becoming increasingly important. The Branch Laboratory has now been equipped with a 25-volt supply, which is proving more satisfactory than that formerly used. A scheme has been brought into operation whereby each member pays 1d. per meeting. This has enabled the Branch to purchase additional Electrical Straight Rails, and it is hoped shortly to make other additions. Chairman: Mr. K. Addinell, B.Sc., 4, Kenwyn Court, 40, The Grove, Isleworth, Middlesex.

First Sheffield.—The main features of the Branch programme have been timetable working on the Branch layout. A pick-up goods train serves most of the stations, each member attaching a destination slip to the wagons at his station. Constant watch is kept on L.M.S. trains in the district, particularly on the accelerated express services to and from St. Pancras, London. Attendances have been smaller than usual, owing to certain members being away at school; this has necessitated expert track operation, and has increased interest. It is hoped to extend the electrified section. Secretary: W. B. Hutchinson, 35, Linden Avenue, Sheffield, 8.

Islington.—The Model Railways and Handicraft Exhibition held in St. Giles Hall, Barnsbury, in November, was a great success. Many ingenious models constructed by the various Sections of the club were on view, and these were supplemented by Super Models on loan from Headquarters. A miniature electric railway was in operation, and model engines of various designs were displayed. Mr. F. Bennett opened the Exhibition, which attracted many visitors. New members are heartily welcome, and anyone interested should write to, or see the Leader, Mr. V. Miller, 25, Bewdley Street, London, N.1.

Folkestone.—Three stations on the Branch layout have been re-painted. The main track is non-continuous, and represents the S.R. line from Folkestone Junction to Victoria Station. "Dover Marine" Station is shortly to be reconditioned and brought up to the standard of "Folkestone Harbour" Station, which has a realistic glass roof. A new Hornby 4-4-2 tank locomotive has been obtained, bringing up to nine the number in use for the heavy Winter services. Both electric and clockwork trains are now run. It is hoped to have an Exhibition for members only very shortly. Secretary: Mr. F. E. Saunders, 79, Dover Road, Folkestone, Kent.

Dover.—Branch rules and regulations regarding track operation were revised at the beginning of the Session. Each member was allotted a permanent post, such as locomotive foreman or platelayer, and acts in this capacity at track meetings. Suggestions for improving Branch programmes were invited, and several are now under consideration. The layout in use is non-continuous. Keen interest was aroused by a train re-painted in S.R. livery by the secretary. Separate Games Nights are arranged for the Junior and Senior Sections, in addition to one at which all members are present. There are still vacancies for Hornby enthusiasts wishing to join this Branch, and anyone interested should get into touch with the secretary. Secretary: D. F. Moore, 3, St. John's Road, Dover, Kent.

A. W. R. Coomber is secretary of the Bedford School Branch No. 310, the Chairman of which is Mr. W. H. Coomber. The Branch was incorporated in July, 1936. Strict timetable working is followed at track meetings, and a splendid display of train running on the Branch layout was given at a recent Exhibition.

Wandsworth No. 1 (Balham).—The Branch has now moved to its new club room, which is much larger, and members worked hard in preparing benches for a layout measuring 15 ft. by 12 ft. The Recruiting Campaign has resulted in increased membership, but there are still a few vacancies for anyone interested in this splendid Branch. A "Tuck Shop" that has been started is proving a great attraction. A very enjoyable evening was spent at the 16th Balham and Tooting Scout Concert. A Debate, *"Steel v. Tinplate Track,"* was held, the voting at the end resulting in a tie. An interesting evening was spent timing various locomotives, a Hornby Locomotive 16 years old proving that it could still run splendidly. Stewards have now been appointed to help the secretary with his work. A Film Show is to be held in February. Members of the public will be cordially welcomed, the proceeds being towards club funds. Secretary: A. H. St. L. Walker, 68a, Oakmead Road, Balham, London, S.W.12.

Northampton.—The weekly meetings are now held alternately on Wednesdays and Fridays. The Branch has an extensive layout consisting of four main stations, and meetings are devoted to the running of timetables in accordance with real railway practice, and the holding of Shunting Competitions. Games Nights are held once every three weeks, and the meetings are varied occasionally with Talks and Debates on railway topics. Each station has its own members under the Leadership of a station captain, and the stations compete between themselves for the Branch Shield. During the summer places of railway interest are visited. Secretary: P. C. Collier, 33, Sandringham Road, Northampton.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this organisation should communicate with the promoters, whose names and addresses are given below.

Ayr—A. Kay, 53, Bellesleyhill Avenue, Ayr.
London—P. Chesson, 2, Exbury Road, Catford, S.E.6.
London—D. A. Cook, 22, Elmhurst Drive, South Woodford, E.18.
Newquay—K. C. Keeping, "Robinswood," Trenance, Newquay, Cornwall.
Tredegar—W. D. Haggar, Sirhowy Mixed School, Tredegar, Mon.
Upminster—E. Posselwhite, 68, Deyncourt Gardens, Upminster, Essex.

Branches Recently Incorporated

336. Banbury—J. Prescott, 6, Twyford Grove, Banbury.
337. Croydon—Mr. J. C. Moss, Hurst House, Hurst Road, Croydon.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

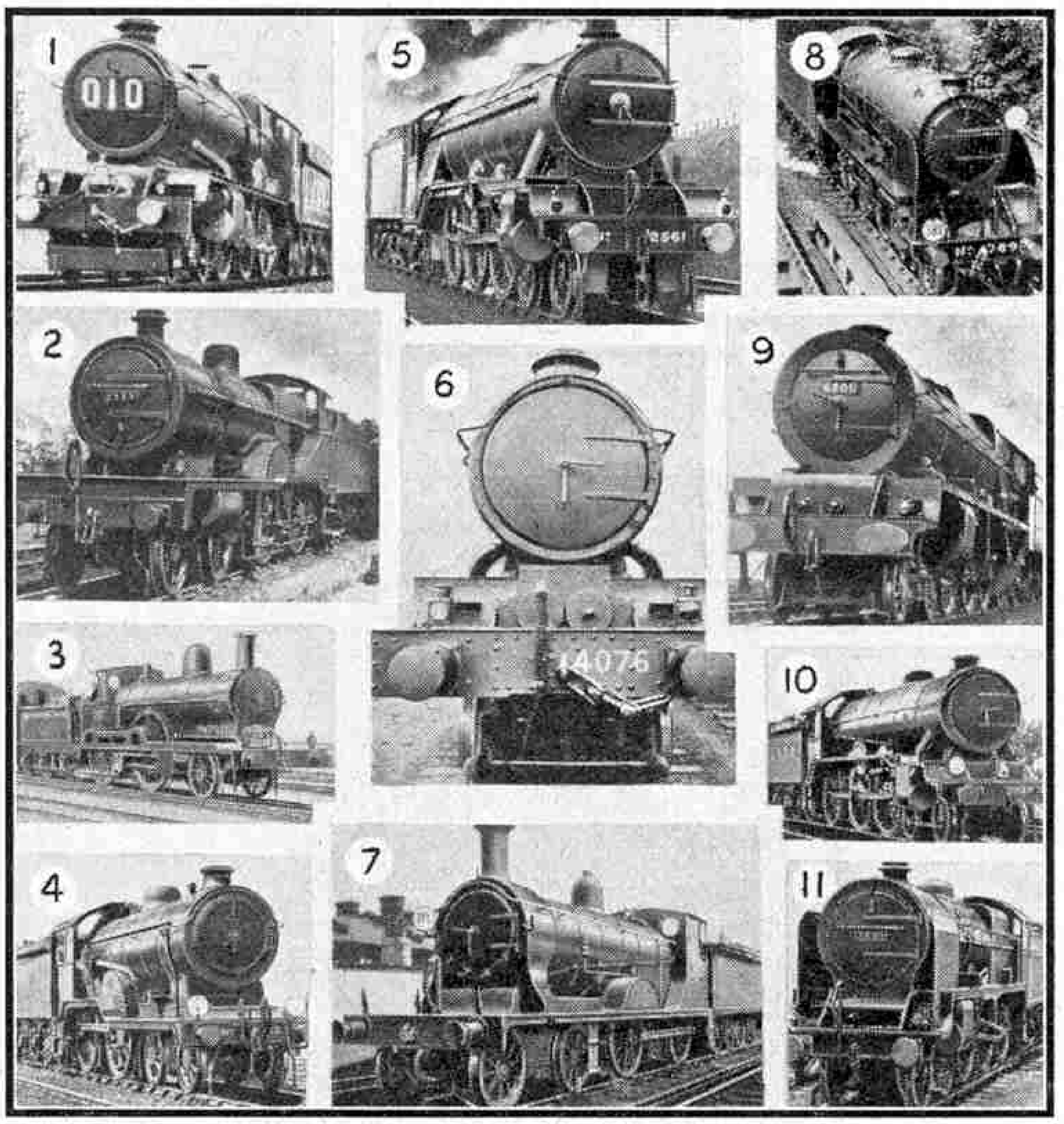
H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

"LOCOMOTIVE FACES" CONTEST

The front ends of locomotives are full of character. They vary to a surprising extent, and it is not only possible to recognise different classes by them, but also to see in them expressions of definite characteristics. In this the smoke-box door plays a very prominent part. It might be described as the "face" of a locomotive, as a glance at the 11 photographs reproduced in our illustration shows, and its combination with the buffer beam, and in some cases the steam pipes and cylinder fronts, with the chimney surmounting the whole, gives a decided individuality to an engine.

With this in mind we have decided to make "*Locomotive Faces*" the subject of our competition this month. All the locomotives shown in the illustration on this page are well known to readers. They have been selected because of the widely differing appearances they present when seen from the front, and also because they are good examples of individuality of the kind suggested.



How would you describe the expressions on the "faces" of the 11 locomotives shown above. This is the subject of an attractive competition of which details are given on this page.

Competitors are required to do two things. First they have to identify the locomotives shown—an easy matter for keen H.R.C. members—giving their class and wheel arrangement and the names of the companies owning them. Then they have to sum up in a single word, or at most in two words, the characteristic appearance of the face of each of them, as revealed by the photographs.

The competitor who is most successful in identifying the locomotives, and who submits the best list of expressions for the 11 locomotives will be adjudged the winner.

The competition will be divided into two sections, Home and Overseas, and prizes consisting of any products manufactured by Meccano Ltd., to the respective values of 21/–, 15/– and 10/6 will be awarded to the senders of the three best entries received in each section. In addition a number of consolation prizes will be awarded. Entries should be written out on one sheet of paper only, on the back of which must be written the competitor's name, full address and H.R.C. membership number.

Envelopes containing entries should be marked "*H.R.C. Locomotive Faces Contest*" in the top left-hand corner and posted to reach Meccano Ltd., Binns Road, Liverpool 13, on or before 28th February. The latest date on which entries from competitors in the Overseas Section can be received is 31st May.

Articles Suggestions Contest

The purpose of the H.R.C. pages of the "*M.M.*" is to assist members in the operation and planning of their layouts and to enable them to get the most fun from their hobby. In order to help us to do this thoroughly, we invite members to submit six suggestions for articles dealing with points on miniature railway working on which they themselves would like further information. In most cases titles for the articles will be sufficient, but if necessary a few words of explanation may be added. Wherever possible articles dealing with the subjects suggested by competitors will be included in the "*M.M.*" in due course.

The contest will be divided as usual into two sections, Home and Overseas, and prizes consisting of any products manufactured by Meccano Ltd. to the value of 21/–, 15/– and 10/6 respectively will be awarded in each section to the three competitors whose suggestions are considered best by the judges. A number of consolation prizes also will be awarded. In the case of a tie for any of the prizes, general neatness and novelty in presentation will be taken into consideration.

Members entering for this contest must write their names, H.R.C. membership numbers and full postal addresses on the backs of their entries. Envelopes containing these should be clearly marked in the top left-hand corner "*H.R.C. February Articles Contest,*" and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 28th February. The closing date for Overseas competitors is 31st May.

COMPETITION RESULTS

HOME

November "Layout Planning Contest."—First: F. Mills (31), Kearsley, Nr. Bolton. Second: A. C. W. Bluett (54839), Kensal Rise, London, N.W.10. Third: W. B. Hudson (1733), Weymouth, Dorset. Consolation Prizes: C. E. Wrayford (6039), Bovey Tracey Devon; W. Scott-Crosse (34990), Northampton.

November "Voting Contest."—First: C. L. Scoles (43251), Bembridge, Isle of Wight. Second: C. Davitt (53987), Dublin, I.F.S. Third: C. W. Thomas (30464), Maybole, Ayrshire. Consolation Prizes: E. C. Peart (50953), Hollinwood, Oldham, Lancs.; K. Costain (5108), Bolton, Lancs.; D. Matheson (54305), Glasgow, E.1; N. Pinching (52323), Oxford; D. Fairweather (52883), Arbroath, Angus; J. O'Dwyer (53592), Leigh-on-Sea, Essex.

OVERSEAS

August "Photographic Contest No. 5."—First: H. Bennett (10615), Auckland, S.W.2, New Zealand. Second: R. Pearson (29199), Victoria, Australia. Third: J. A. Markham (54284), Ontario, Canada.

August "Sharp Eyes Contest."—First: A. R. Bacon (38242), Bombay, India. Second: A. A. Shawky (53749), Egypt. Third: R. Pearson (29199), Victoria Australia.

SETS (Postage Extra)

3 Canada Jubilee ...	4d.	5 Kenya	3d.
1 Ceylon „ ...	2d.	5 Kenya, Ugan., Tan.	3d.
3 „ Cor. ...	11d.	1 „ „ Jub.	3d.
1 Dominica Jub. ...	4d.	3 „ „ Cor.	1/-
3 „ Cor. ...	9d.	5 Malta	2d.
1 Grenada Jub. ...	4d.	10 „	5d.
3 „ Cor. ...	9d.	1 „ Jub.	2d.
2 Gold Coast Jub. ...	8d.	3 „ Cor.	8d.
3 „ „ Cor. ...	9d.	10 Fed. Malay States	5d.
5 Hong Kong ...	2d.	5 Nigeria	3d.
10 „ „ ...	5d.	10 „	6d.
1 „ „ Jub.	4d.	1 „ Jub. ...	3d.
3 „ „ Cor.	1/-	3 „ Cor. ...	10d.
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4 „ Jub.	6d.	10 „ „ ...	5d.
10 Jamaica	5d.	1 „ „ Jub.	3d.
1 „ Jub. ...	2d.	3 „ „ Cor.	10d.
3 „ Cor. ...	9d.	20 New Zealand ...	6d.

J. RUSSELL,
23, SHANKLIN DRIVE, WESTCLIFF-ON-SEA.

ONE THOUSAND STAMPS ON APPROVAL

From which you may select any 100 for 3/-. This selection is not made up of the very commonest varieties, but contains stamps catalogued at 1/- each or more. (I do not sell less than 100.) During this month I will include a stamp cat. at least 3/-. Can you find it? A returnable deposit of £1 is required from overseas applicants.

H. HARDY, "Hoyland," Potter Heigham, Norfolk.

5 DIFF. CORONATION STAMPS FREE for postage 2d. Sanders, 90, Newlands Avenue, Southampton.

STAMP COLLECTOR'S OUTFIT FREE!

Whether you are a new collector or a seasoned Philatelist, you will find the **contents** of this wonderful advertising offer of great use. They include: Ruled Duplicate book, in which is incorporated a millimetre perforation measurer, 34 all different stamps (no common Germans), pkt. of stamp mounts, metal watermark finder, 100 Titles of Countries. Amongst the fine stamps are sets of Colonials, Philippines, Bohemia, Hungary, old Canadians (King George), Indians and Australians, and Swiss. Finally, two splendid sets, 5 LATVIA and 5 ESTHONIA. Complete parcel, including 1938 Catalogue, absolutely free. Just send 2d. postage requesting approvals and list of further gifts.

LISBURN & TOWNSEND LTD. (Dept. M.M.), LIVERPOOL 3

FREE WONDERFUL 1938 OFFER 20 NEW ISSUES AND NOVELTIES

Including **ANDORRA** (new), Belgium, Canada, Denmark, **FRENCH EQUATORIAL AFRICA** (pictorial), **GRENADA (King George VI), GREECE (Bull vaulting scene),** Jugo Slavia, **KELANTAN** (Sultan Ismail), **MOZAMBIQUE CO. (Giraffe), MOROCCO AGENCIES (King George VI, already obsolete),** Turkey, etc. I will send this collection absolutely free to all stamp collectors **sending 2d. postage** (abroad 4d.).

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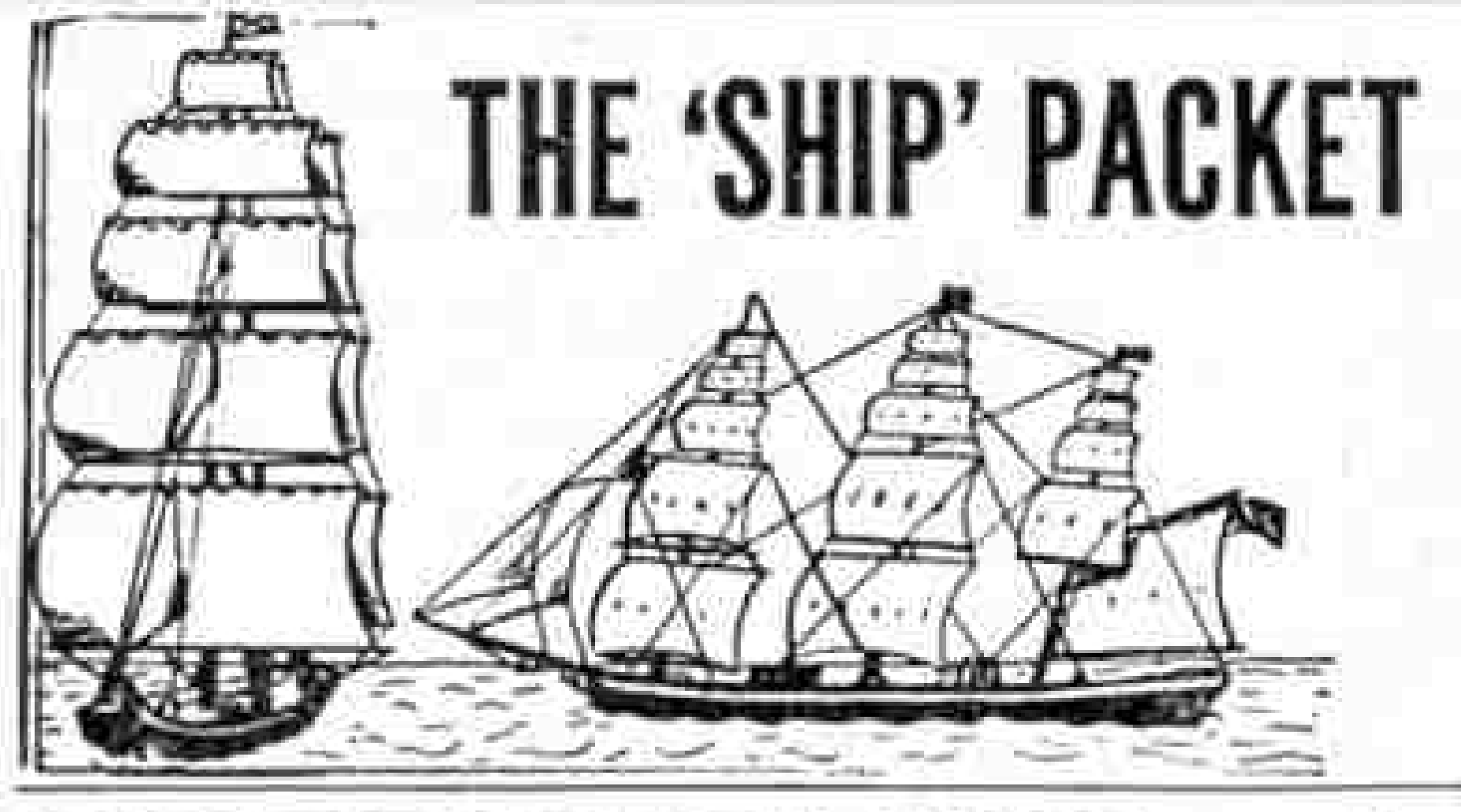
This super packet containing over 50 Pictorial, Airmail and Colonial Stamps only, all modern issues from **GAMBIA, EGYPT, CEYLON, GOLD COAST, KENYA, TANGANYIKA, MADAGASCAR, SIERRA LEONE,** scarce **EUROPEANS, NORTH & SOUTH AMERICA,** etc., offered absolutely

FREE

to genuine collectors sending 2d. stamp for postage, etc., and requesting selection of **AIRMAIL** and **PICTORIAL STAMPS** on approval. This splendid packet is offered entirely to introduce selections of modern stamps on approval, and if sent without approvals price will be 1/- post free. (Abroad 1/6 with or without approvals.)

C. H. SHAW (DEPT. 2), 95, CHRISTCHURCH AVENUE, KENTON, HARROW, MDDX.



THE 'SHIP' PACKET

This marvellous packet is offered under cost as an advertisement, **45 different stamps each with a ship on it.** A regular armada. **KOUANG-TCHEOU,** new, **SENEGAL** (Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **NEW CALEDONIA, UKRAINE, COSTA RICA,** a fleet of **7 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, MAURITIUS, KENYA-TANGANYIKA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, POLAND, INDO CHINA, FRENCH OCEANIA, WALLIS & FUTUNA ISLANDS,** etc. Price **4½d.,** postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **3 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **6 VENEZUELA or 6 PERSIA. 100 BRITISH COLONIALS 1/-, 20 AIRPOST 6d., 6 TRIANGULARS 7d., 50 PERSIA 4/-, 9 POLAND New Pictorials 8d., VOLUMES OF B.O.P. CHEAP.**

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(British 1840 Penny Black) for P.O. **3/6.** It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further **5/9** (cat. 17/6)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars;** we offer 1d. rose (cat. 40/-) for **12/6;** 4d. blue (cat. 15/-) for **5/-;** and 6d. pale lilac (cat. 40/-) at **15/-.** Superb approvals of any country against approved English References or a deposit. **Full Lists Free.**

NORRIS & CO. (Dept. M), Norwood, London, S.E.19.

GENUINE BARGAIN

75 Different Foreign and Colonial Stamps selected from Collections presented to Hospital. Send 6d. and addressed envelope (unstamped) to:

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Memorial Hospital Hall, Woolwich, LONDON, S.E.18.

STAMPS! GIFT OF 10 PICTORIALS sent to each applicant for Approval Sheet. Mention "Meccano." C. Stroud, 30, Kendor Avenue, Epsom, Surrey.

MORE BARGAINS

APPROVALS—Always the Newest. Send to me for my famous **Bargain Approvals**—these contain Coronations, Jubilees and all the latest K.G. pictorial Cols. **Used Cors.:** Caymans, Falkl'ds, Montserrat, Cyprus, Kenya, Nyasaland, 10d. per set. All mint sets in stock.

FREE Special packet of 10 Mint new and recent issues, British Colonials only, to all purchasers of 2/6 from the above, or to genuine approval applicants enclosing 2d. for postage.

T. R. HUGHES (P.T.S.),
'IBIS COTTAGE,' LONG PARK, AMERSHAM.

"DIAMONDS"

MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet,** which contains approx. **1,000 UNSORTED STAMPS** from Convents abroad. **1 pkt. 1/6, 3 pkts. 3/9, 5 pkts. 6/-. All post free inland.** Postage to Colonies **3d. per pkt. extra.** S. Africa and Foreign **6d. extra.** Beware of imitations.

O. NERUSH
(DEPT. "A"), 68, TURNPIKE LANE, LONDON, N.8.

TRIANGULAR PACKET

This rare and beautiful stamp was issued by Spain to commemorate the explorer Columbus, and shows his Flagship, *Santa Maria*. We are presenting it **FREE,** together with **10 other fine Spanish issues, including General Franco stamps,** to all readers requesting approvals, and including 2d. postage. (Without approvals, price is **9d.**)

MICHAEL HERBERT
(M), 88, EDINBURGH ROAD, WALTHAMSTOW, LONDON.

FREE 25 COLONIAL AND FOREIGN PICTORIALS CAT. 10/-

THIS MARVELLOUS PACKET, VALUED AT 2/6, is offered as the **GREATEST** New Year's gift to applicants for my well-known "Value" approvals.

JUBILEE AND CORONATION issues, **PICTORIAL INDIAN NATIVE STATES, SCARCE HIGH VALUE,** mint **AMERICAN** issues and beautiful **PICTORIALS AND COMMEMORATIVES** (mint and used) are included. **YOU** will be **DELIGHTED AND SURPRISED** at the **VALUE OF THIS GIFT.**

To the **FIRST 20 APPLICANTS** I'll also give a **SCARCE SPANISH CIVIL WAR STAMP.**

SENT POST FREE BY RETURN.

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THE CROWNING PACKET

This splendid packet contains modern issues, mint and used, including **Canada Coronation,** Kenya (boat), **Cayman Islands** (map and fishes, mint), **Bermuda** (Hamilton harbour, mint), **Australia** (pictorial and New **King and Queen**), Belgium (Prince Baudouin, mint), **Grenada (the beautiful new mint King George VI),** 5 different **Canada** including the new 1937 issue, the Royal Canadian Mounted police **and also the scarce 20 cent Niagara Falls,** 5 Yugo Slavia, 5 Belgium Parcels post, and finally **2 more Coronations and 2 Silver Jubilees.**

All these good stamps for 6d. only, to genuine applicants for our approval sheets. (Without approvals, 1/-.) No sheets sent abroad unless reference given.

SHIRLEY STAMP CO., 19, SANDRINGHAM AVENUE, LONDON, S.W.20.

100 diff. Stamps Free to approval applicants, good discount.—Gosling, 21, Powling Road, Ipswich.

STAMPS OF THE WORLD. Send for Approvals. J. Peers, 51, Grange Road, Sale.

DON'T GO AWAY

Send 1½d. for approvals and receive THREE FREE GIFTS. YOUR OWN CHOICE. Brit. Colonial and Foreign. New & Old. Singles & Sets. Used & Unused.

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Stamps on approval from ½d. upwards. Good value given. Rogers, 30, Watling Street, E.C.4.

STAMPS OTHERS HAVEN'T GOT

COROS., TRIANGS, AIRMAILS, etc., from ½d. To Approval applicants sending 1½d. postage **TWO FREE PACKETS** including **B. COLS., TRIANGULAR & MODERN PICTS.**

E. F. HILL (R), 37, TEMPLE GARDENS, LONDON, N.W.11.

APPROVALS

My approvals are worth writing for, apart from the free gift, largely consisting as they do of modern pictorial and commemorative stamps, mostly in sets although priced separately. You should know, too, particulars of my extra free gift plan.

NEWFOUNDLAND

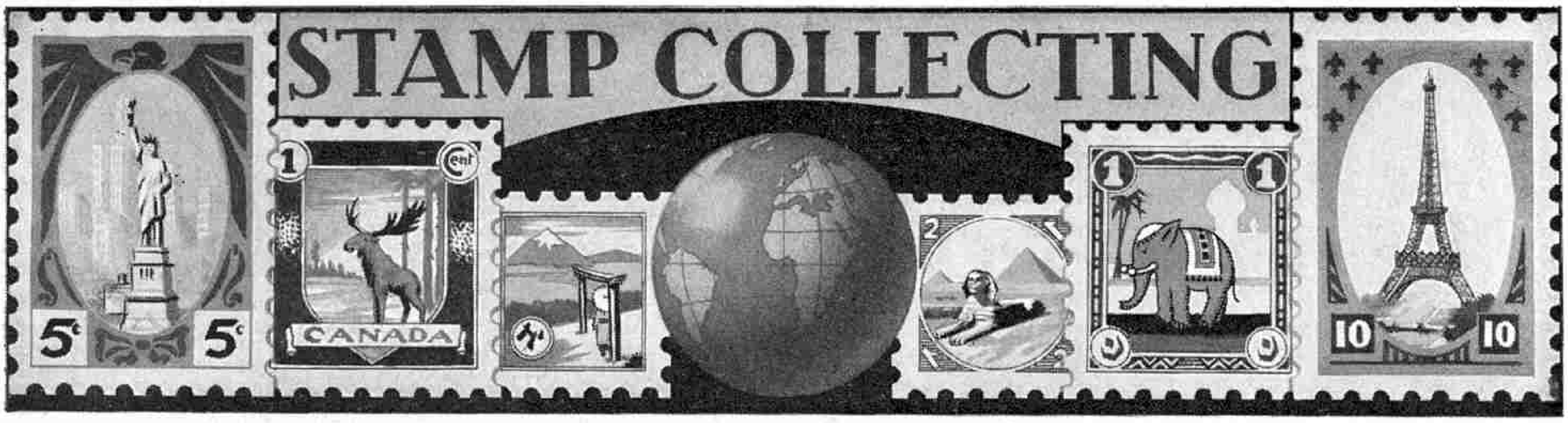
A fine collection of this popular Colony including Caribou set, 1923 pictorials, 1928 King George V and Queen Mary, 1932 Royal Family set and Coronation issue, sent free to all applicants for approvals enclosing 2d. postage.

THREEPENNY SETS

3 Mozambique 1935 Air, 4 Mozambique 1937, 6 Czechoslovakia Legion, 6 Greece 1937, 4 Spanish Morocco (Franco), 5 Algeria 1936, 5 French Morocco 1933. All at 3d. each. All pictorials and unused.

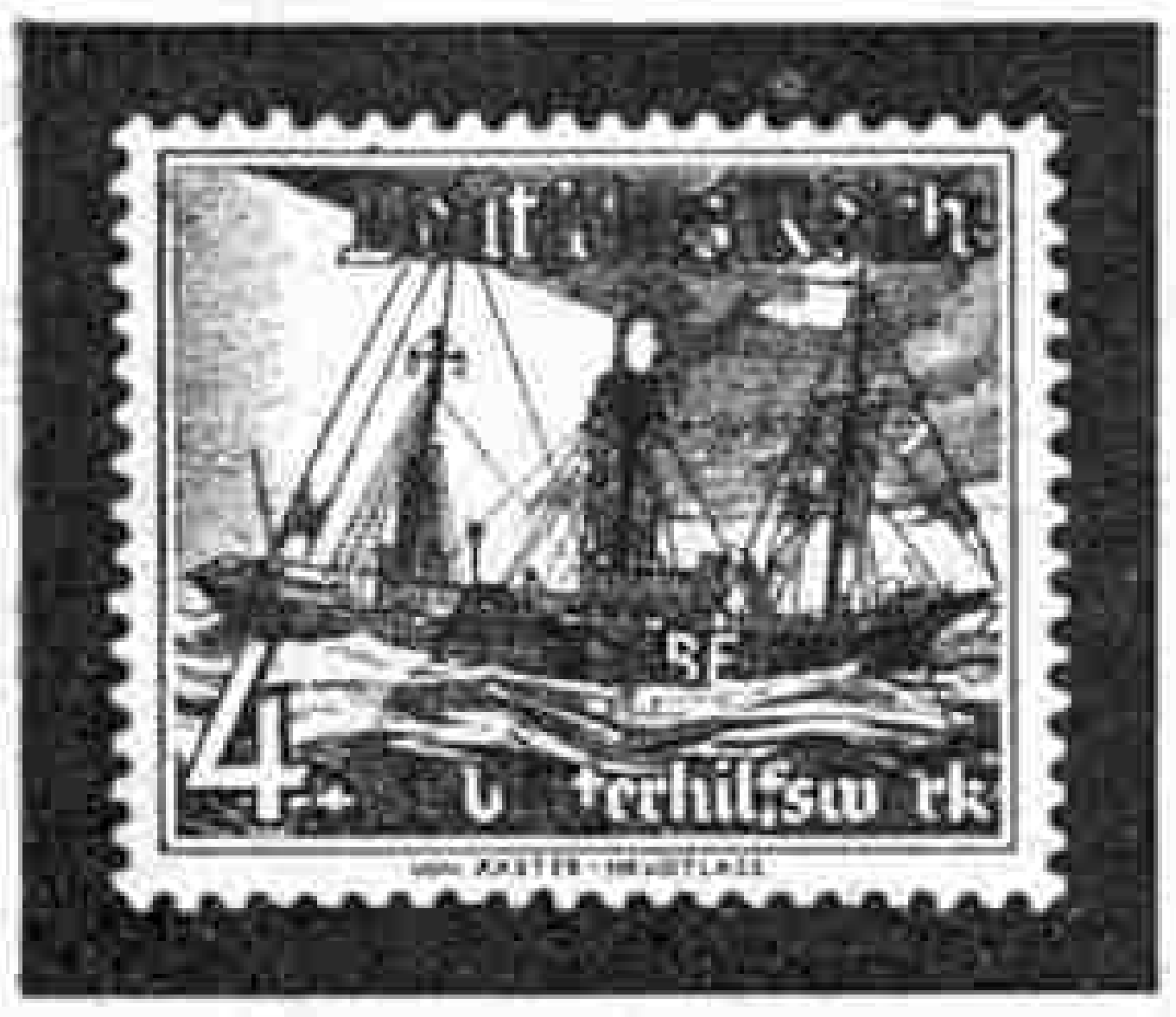
Please Mention Meccano Magazine R. D. HARRISON - ROYDON - WARE **Postage Extra**

For other Stamp Advertisements see pages 124 and xvi



THE WORLD OF SHIPPING

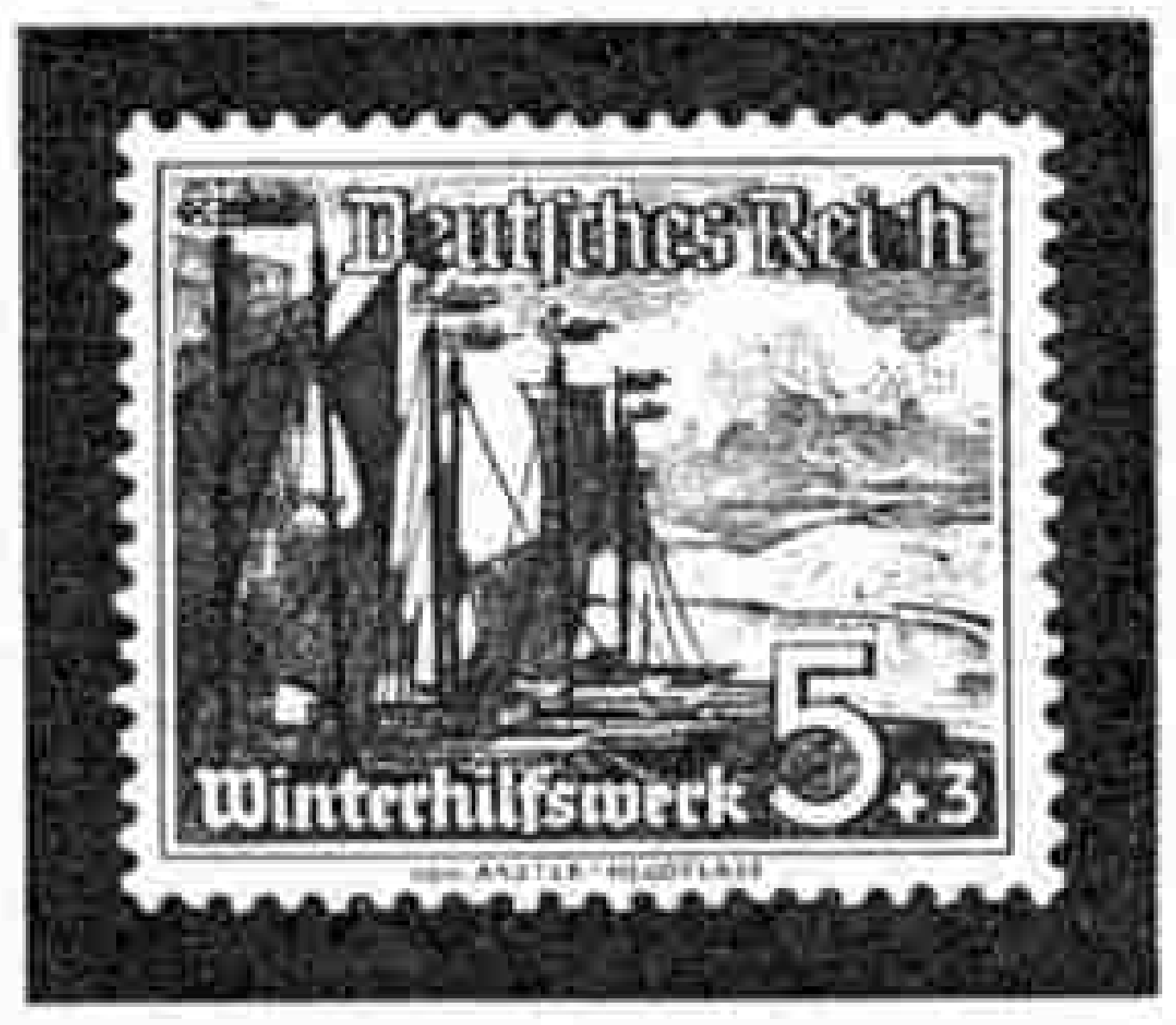
THE recent German "Winterhilf" charity stamps illustrating types of German ships and shipping form probably the most interesting series of shipping stamps ever issued. They would make a splendid nucleus for a collection of such designs.

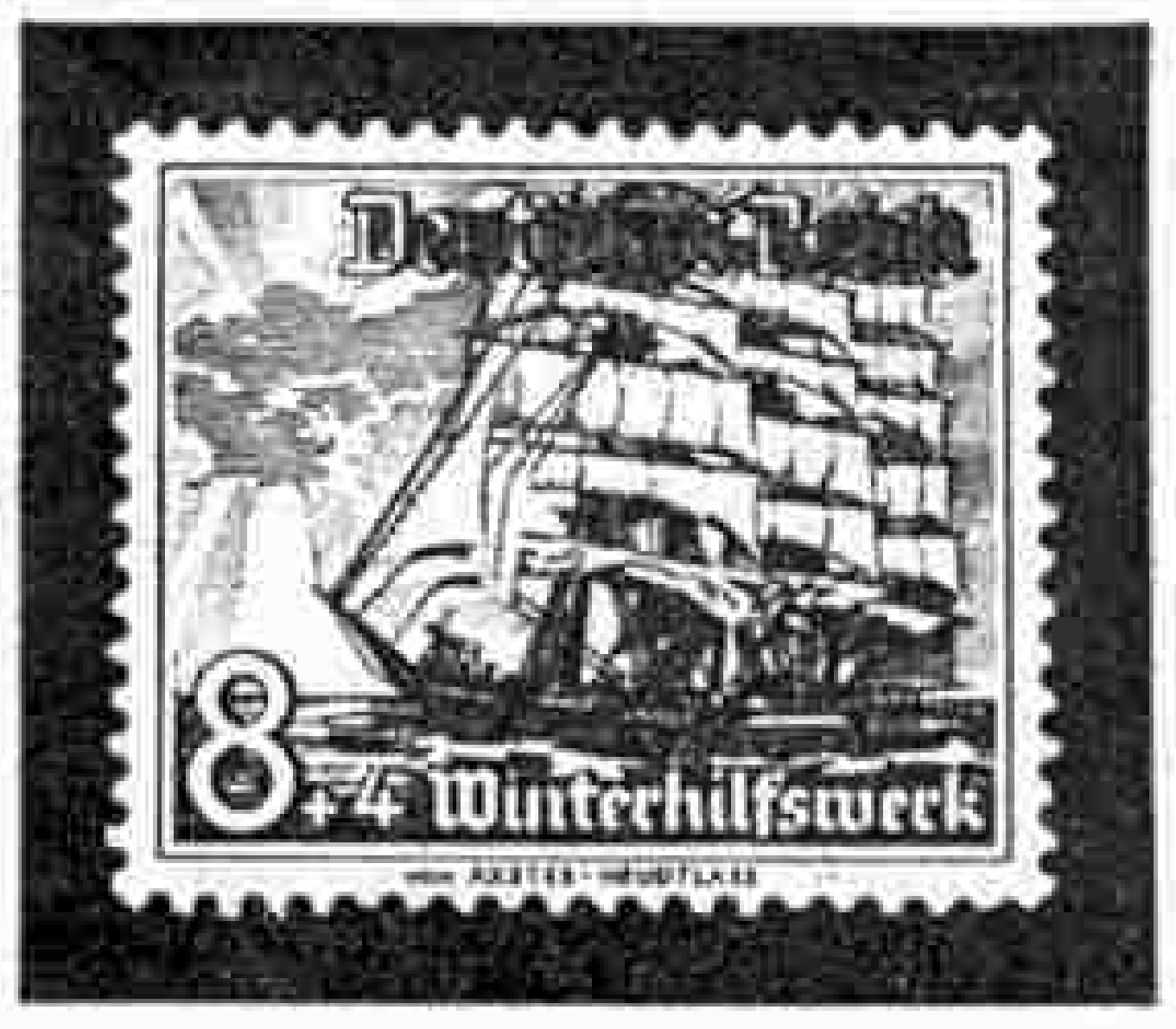


There are nine stamps in the series, and seven of them are shown on this page. Those boys who already possess a range of shipping designs will welcome particularly the 3 pf. and 4 pf. values, which show a motor life-boat and a lightship respectively. These two subjects are entirely new to the stamp album. The remaining designs include fishing smacks, on the 5 pf. value, and the Atlantic liners *"Hamburg"* and *"Bremen,"* shown on the 25 pf. and 40 pf. values respectively. The other designs are: 6 pf., S.S. *"Kraft-durch-Freude"*; 8 pf., a fully square-rigged sailing ship; 12 pf., S.S. *"Tannenberg"* and a lightbuoy; 15 pf., S.S. *"Warnemunde-Gedser."*

These designs reveal the exceptional interest to be found in a collection of stamps devoted to shipping, the whole development of which, from early native canoes to modern Atlantic liners, can be traced easily and at only small cost.

It would be interesting to know how the possibilities of travel by water were first realised by prehistoric man. No doubt, however, the sight of a tree trunk drifting down a forest stream suggested an easy way of travelling through otherwise difficult country, and from that realisation it would be only a short step to the "dugout," the hollowed out tree trunk that is known to have been commonly used by primitive tribes. Another short step would lead to the shaped trunk, propelled by paddles, that was the forerunner of the canoe, many specimens of which are found illustrated on stamps. We think the best of these illustrations is that used on the French Guiana stamps issued in 1929.



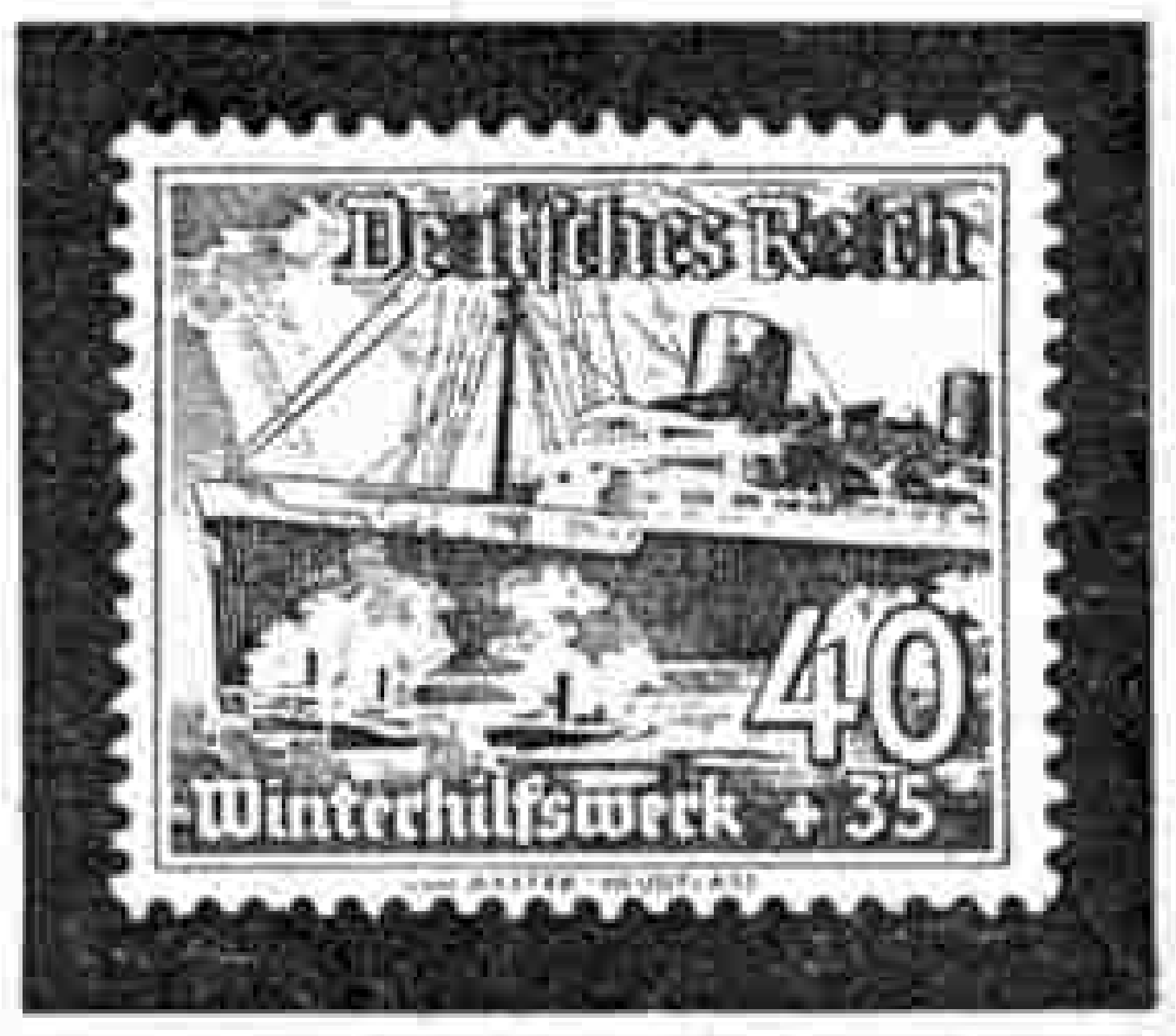


From this stage the stamp story of ships and shipping is of absorbing interest. For instance, we are able to show clearly that sails were fitted to ships in very early times, for the design of the Egyptian Navigation Congress issue of 1926, based on a piece of statuary found in the ruined Temple of Deir-el-Bahari, shows an ancient Egyptian slave galley fitted with a crude sail on a centre mast. Oars pulled by slaves were the main propelling power of this ship, of course. A better illustration of a slave galley is found on the 1 fr. value of the Tunis 1926 series, however. This shows one of the famous Carthaginian galleys used in trading between the Mediterranean ports.

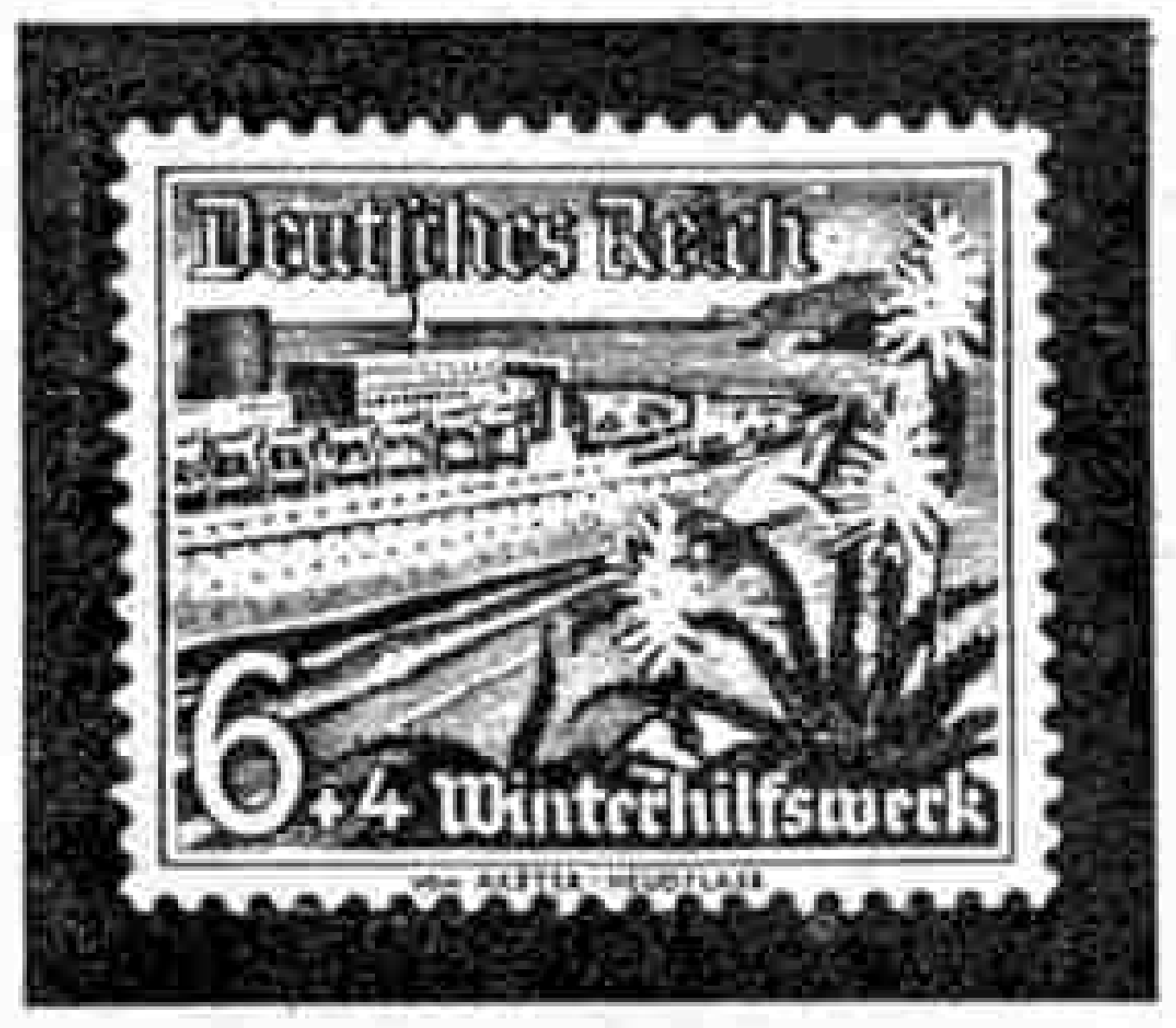
Smaller types of primitive sailing craft found on stamps are Maori war canoes, seen on a Cook Island issue of 1932, Fijian pirogues, shown on the Fiji 189 P. series, and the curious lakatois, or native canoes, illustrated on several Papuan issues.

The ships of the famous Norse Vikings, although much smaller and of a later date than the Mediterranean galleys, had many features of a similar type, as can be seen in the designs used in Denmark's 1927 issue and also on the 5c. value of the U.S. Norse Centennial issue of 1925.

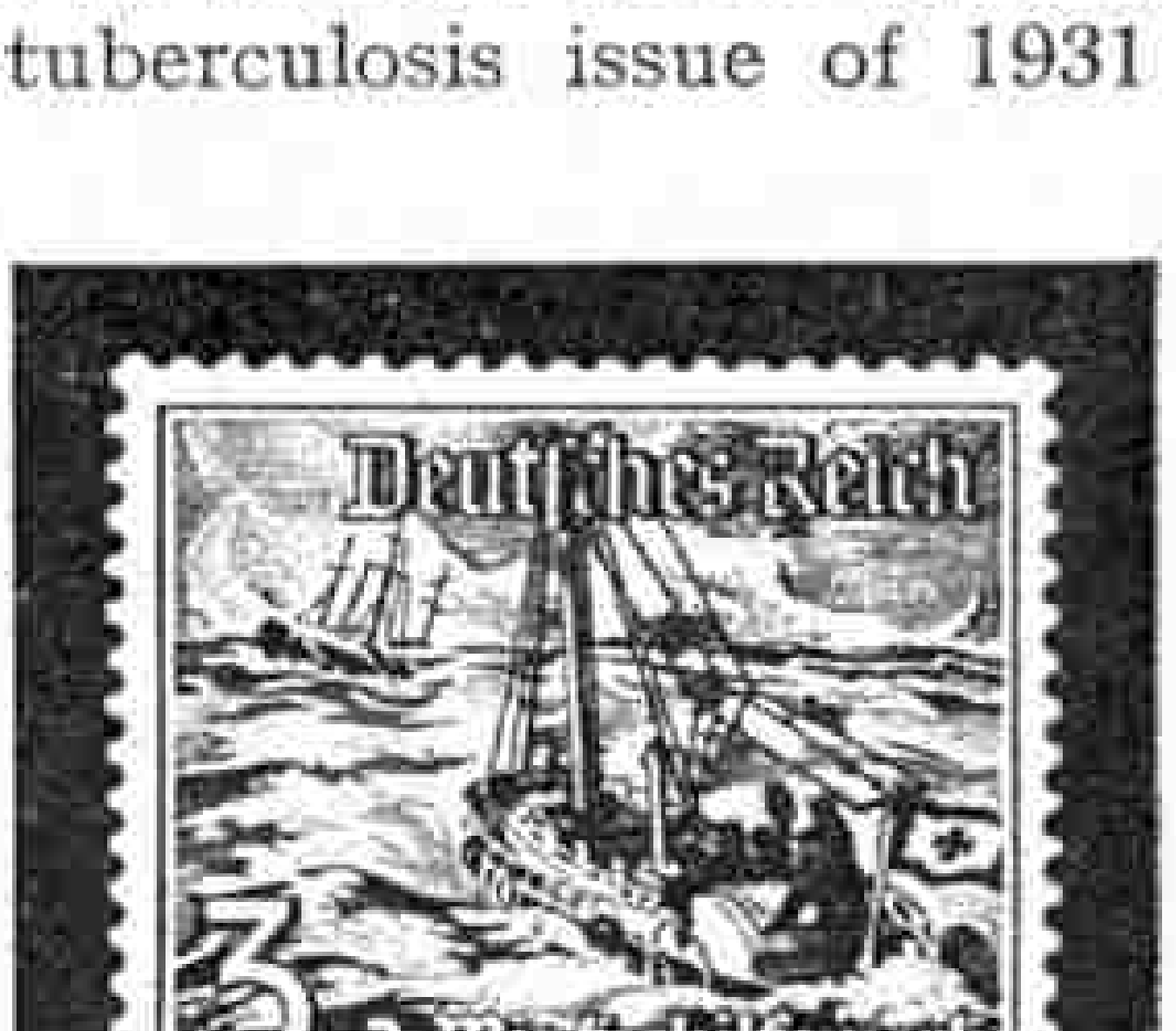
The Vikings were among the earliest seamen to venture across the open oceans but the most famous of the early ocean-going ships were sailed by Columbus, Vasco da Gama and Jean Cabot. The *"Santa Maria,"* the flagship of Columbus, has appeared many times on stamps, and of these the 2c. value of Spain's 1930 issue gives the best picture. Vasco da Gama's caravels also have appeared several times, principally on Portuguese stamps; Jean Cabot's *"Matthew"* is to be found on a 10c. stamp issued in 1897 by Newfoundland, which country also gives us Sir Humphrey Gilbert's *"Squirrel"* on a 1933 issue. The Pilgrim Fathers' *"Mayflower"* is shown on a U.S. 1920 issue.



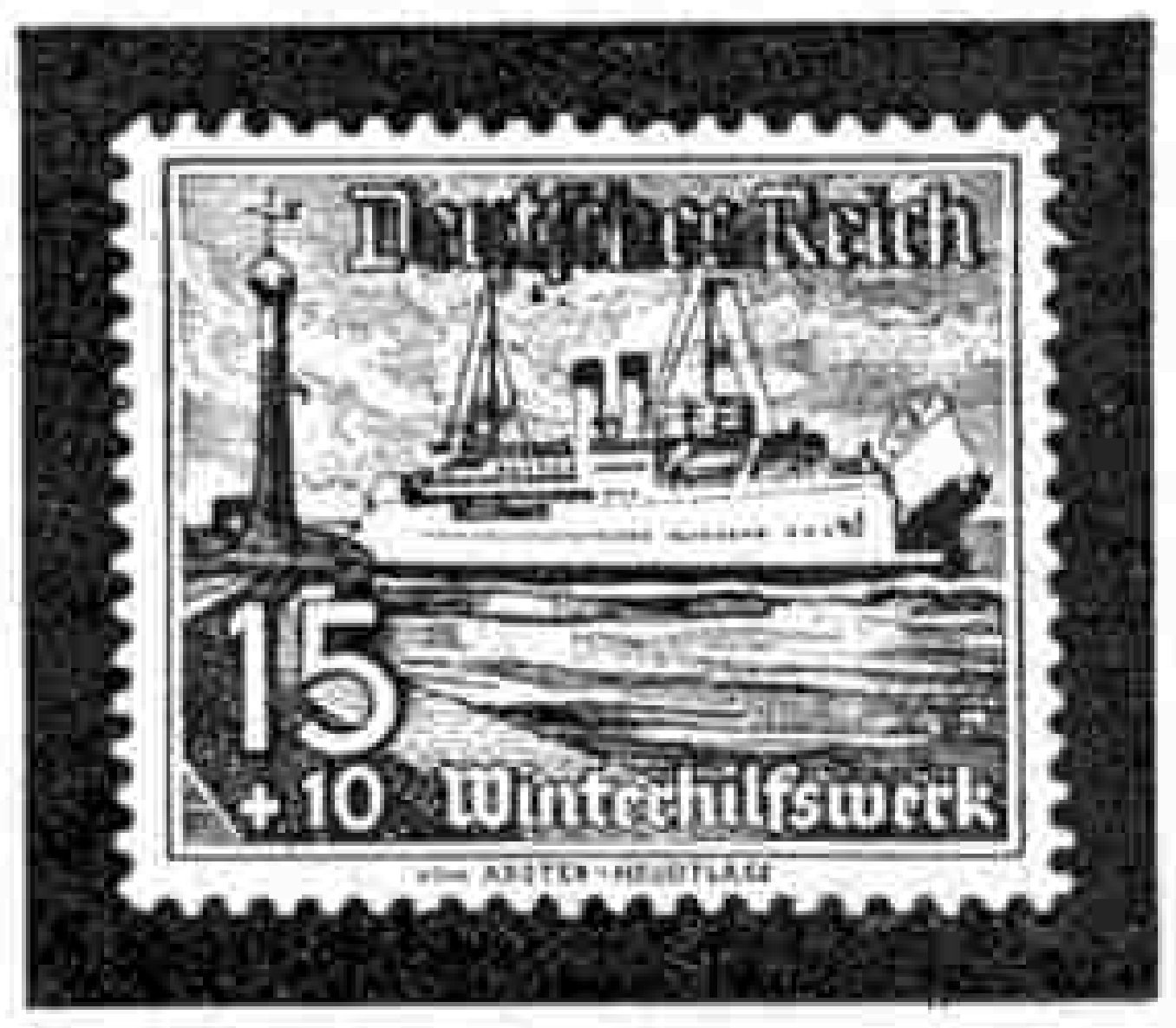
The coming of steam is celebrated on stamps by a picture of the famous Canadian steam auxiliary *"Royal William,"* which made the first transatlantic steamship crossing in August 1833. This picture appeared on Canada's issue of 1933 celebrating the centenary of the voyage.



Passing on to modern steamers, we find a host of interesting designs available, and in the space at our disposal it is impossible to mention more than a few of them. The Nauru issue of 1924 shows an excellent picture of a typical modern cargo boat, while several crack Atlantic greyhounds are to be found in addition to the *"Bremen,"* which is shown on one of the German stamps illustrated on this page. There is the French giant *"Normandie"* on a French 1935 issue, while the Italian ships *"Rex"* and *"Conte di Savoia"* are to be seen on an Italian series issued in 1932. Belgium's anti-tuberculosis issue of 1931 shows a splendid view of Antwerp Harbour thronged with shipping on the 1 f. 75 value. The most beautiful steamship design comes from the Falkland Is., however, and depicts a humble whaler. The stamp on which this vessel is shown is the 1½d. value of the issue of 1933 in celebration of the centenary of the British occupation of the Islands.



Both tramp steamers and pleasure craft are to be seen on stamps, and thus both extremes in the shipping world are represented. A tramp steamer is shown on the 30c. value of the St. Pierre and Miquelon issue of 1932. A famous yacht that is to be seen on a stamp is the racing cutter *"Britannia,"* in the sailing of which King George V took such great delight. A representation of this famous vessel appears on the 13c. value of the Canadian Silver Jubilee issue of 1933.



No shipping collection would be complete without mention of warships, and of ports and harbours, shore radio stations and lighthouses. There is not space to deal with those features this month, but we hope to deal with them in a further section of this story in our next issue.

THE WORLD'S FINEST APPROVAL SHEETS NOW EVEN FINER!

The "S.G." APPROVAL SHEETS are being completely revised and are now even better than before! They are the finest in the world for variety and quality—and therefore the cheapest! It always pays to get the best, so write now for approval sheets of the countries you are interested in.

N.B.—The Sheets are arranged in Catalogue order in countries, so you won't be sent sheets of countries you don't collect if you ask for what you want. There are also special sheets of Air Stamps.

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ENGINE SHED
S/6, 20 in. long, **9/6** *each*
(single road)

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MILBRO *TRUE·TO·SCALE models for reliability*

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1000 UNKNOWN UNUSUAL UNSORTED 1/6

(over 200 diff. guaranteed.)

Stamps on paper, etc., just as received from Convents, Missions, Banks, etc. Guaranteed unpicked. Chance of a **FIND** in every lot. Send to-day for your treasure hunt to-morrow. 3 for **4/3**, 6 for **8/-**. Abroad, extra postage. **FREE!** 25 Br. Cols., including **CORONATIONS**, to Approval applicants. Also **FREE EXCHANGE.** Enclose ptge. Overseas **3d.** Dealers Supplied.

ASTLEY & CO. (M.2), NEWBOLDS, WOLVERHAMPTON

TRIANGLE PACKET!!

This packet contains 2 fine mint **TRIANGULAR** stamps from **LIBERIA** (cat. 1/6) and **MOZAMBIQUE CO.** (Airmail); a pleasing selection of **ASIATIC** stamps including **IRAN** (cat. 1/-), China, **KOUANG-TCHEOU**, India, **CEYLON**; 2 high value **JUGOSLAVIA** (cat. 7d.); large mint **ALGERIA** (pictorial); **B. COLS.** including **GOLD COAST**, S. Africa, **BARBADOS** and the fine **CORONATION CANADA** (K.G. VI and Queen Elizabeth). This packet will be sent free ONLY to those who ask for my free gift approvals and enclose 2d. postage and packing (overseas or without appros., 1/-).

HELY. HUTCHINSON (M.3), HURROCK WOOD, KENTS BANK, GRANGE-OVER-SANDS.

STAMPS FOR BLANK PAGES

300 Different Mint and Used **British Empire** (no foreign) including the ex-German and ex-Turkish possessions of **New Guinea, Nauru, Transjordan, Western Samoa,** and others, **Bahrain** and **Kuwait** in the **Persian Gulf, Brunei** and **Sarawak** in **Borneo, Tonga, Zanzibar** and other Protectorates, **Ascension, Cayman Is., Montserrat, St. Kitts, Virgin** and other West Indian Island Colonies, **Coronation, Scenery, Bird, Beast, Map** and **Ship** stamps, **Aden, Basutoland, Swaziland, Cook, Niue, New Hebrides, Papua, Nabha, Selangor** and other Native States, **Seychelles,** and others too numerous to mention, about **65 Different Colonies, Protectorates, Dominions,** etc., being represented. **Price only 6/1½** (abroad **6/4**) **Post Free.**

Edward Sandell, 10, Evelyn Gr., Southall, Mx.

KINGSMILL STAMP CLUB

Do you belong to a stamp club? No? Here is your great chance.

There is NO entrance fee, and NO subscription to the KINGSMILL STAMP CLUB, but there are many advantages, including a free packet of attractive stamps every month, with special approvals made up to suit members' requirements. Every type is catered for, whether you are a beginner, medium, or advanced. Apply for membership now, sending 1½d. stamp to:

G. KINGSMILL (D.W.E.C., S.T.P.A.), Dept. M.M., NEW BARNET, HERTS.

HARD-TO-GET STAMPS and MODERN AT PRICES YOU WANT TO PAY

Series A,	Series B,	Series C.	Series D,
Air Mail Stamps.	Foreign.	British Colonials.	General.

All applicants for approvals as above will be sent any one of the following free gifts: **16 Air Mails** (no inflated issues) or **25 New Issues,** inclusive of set five new Greece Classic (just out) or two British Col. Cat. 10/-.

Only good class stamps in perfect condition. Try these New Issue bargains:

Egypt Ophthalmic 1937, set of 3 values mint **1/3**
U.S.A. Porto Rica 3c. 1937 ... **3d.**
Danzig Xmas Charity, set 5 ... **1/8**

Czechoslovakia new value 1Kr.60c. **6d.**
Panama Fire Brigade Jubilee, set 3 Air Mails **2/-**. Set 6 postage **2/-**
or the two sets (9 stamps) **3/9**

Also my new **COLLECTION BUILDING PACKET** containing 100 used and unused pictorials (mostly recent issues) at **6/6.** This is excellent value.

M. COURT, 76, WILLOWDALE ROAD, LIVERPOOL, 9.

FREE THE WONDER PACKET.

Ask for my approval sheets and new lists and enclose 1½d. postage and I will send you the following packet absolutely **FREE—50 FINE STAMPS** including new **IVORY COAST,** a handsome stamp, two **CORONATION COLONIALS, BRAZIL** airpost (curious looking stamp), **GREEK,** Red Cross, **DENMARK (SILVER JUBILEE),** 2 new **POLISH** Pictorials (fine), **2 NEW ZEALAND** (Zoological Pictorials, new), **PALESTINE,** etc. **STAMP BARGAINS.** 10 Persia 3d., 10 Peru 4d., 100 different British Colonials 1/-, 6 Triangular 7d., 1,000 different 3/11, 45 Coronation (one from each Crown Colony) 5/-, 20 Brazil 10d. My new large list of 700 Bargains, post free 1½d. Send addresses of stamp-collecting friends and receive 6 Venezuela or 3 Ichang.

H. C. WATKINS (M. Dept.), GRANVILLE ROAD, BARNET.

ALL BRITISH COLONIAL APPROVALS

Fine BRITISH AFRICAN PACKET including scarce **GAMBIA** set, **KENYA COLONY, MAURITIUS, TANGANYIKA,** etc. **FREE** to collectors sending 2d. stamp for postage, etc., and requesting selection of **ALL BRITISH COLONIAL STAMPS** on approval. **BRITISH COLONIALS** only on approval at bargain prices, including **JUBILEE, CORONATION** and **PICTORIAL ISSUES** from West Indies, Africa, Cyprus, Gibraltar, Iraq, Palestine, Papua, etc. (No stamps sent Abroad.)

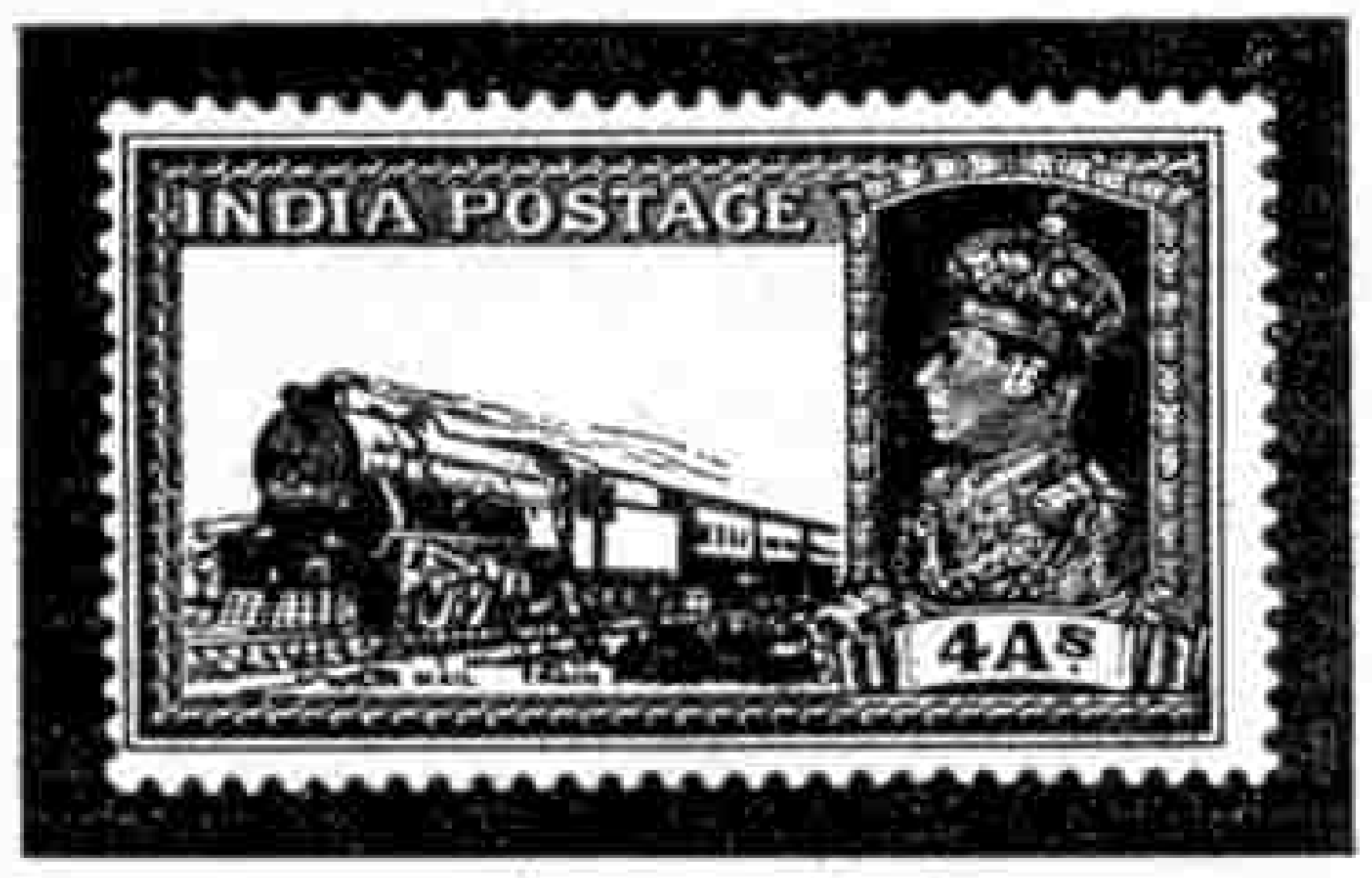
C. H. SHAW
(Dept. M.2), 95, Christchurch Av., Kenton, Harrow, Mddx.

KQDRS

'KQDRS' is not important and does not really matter. But our February Free Gift is important, for this monster **FREE** packet of 66 stamps includes **CANADA** (Royal Mounted Police); **DENMARK** (Hans Anderson Centenary); **JAPAN** (Mt. Fuji); **ITALY** (Augustus the Great); **DENMARK** (Caravel); **REUNION** (Waterfall); **TOGO** (Coconut Trees); **MONACO** (Arms); **SUDAN** (Woman Marketing); **NIGER** (Water Wells); **U.S.A.** (Washington Bicentenary); **MADAGASCAR** (Gallieni); **GUINEA** (Fording river) as well as a fine set of 5 from **DANZIG FREE STATE** and a set of the new **CANADIAN** George VI stamps. This colossal packet of many pictorial and commemorative emissions will be sent you absolutely **FREE** by requesting approvals and enclosing 2d. stamps (abroad 6d.) We will also send you in addition a packet of Stamp Hinges free.

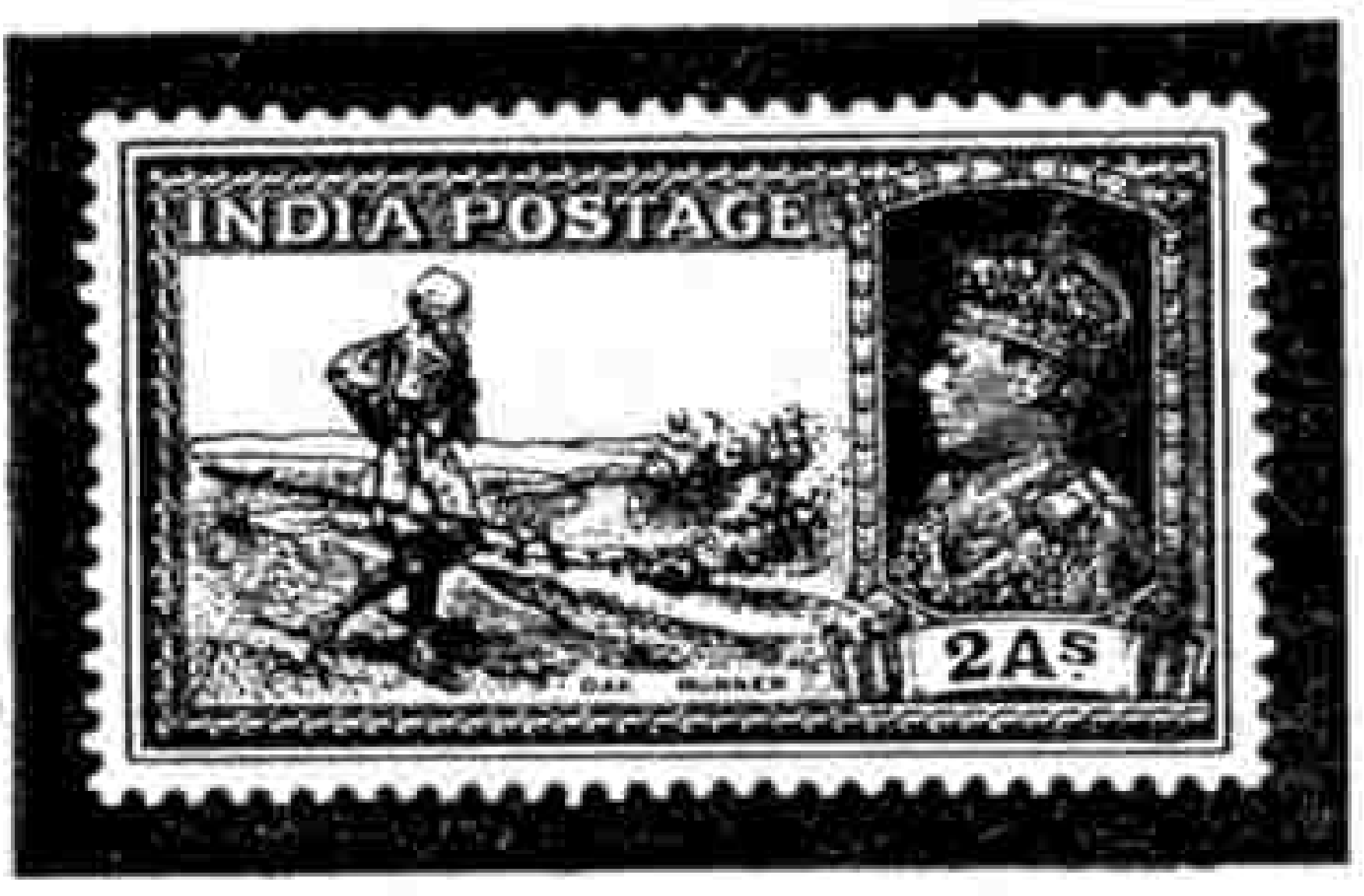
WINDSOR STAMP CO. (Dept. M), 59, LEE ROAD, BLACKHEATH, S.E.3.

For other Stamp Advertisements see pages 122 and xvi



Stamp Gossip

and Notes on New Issues

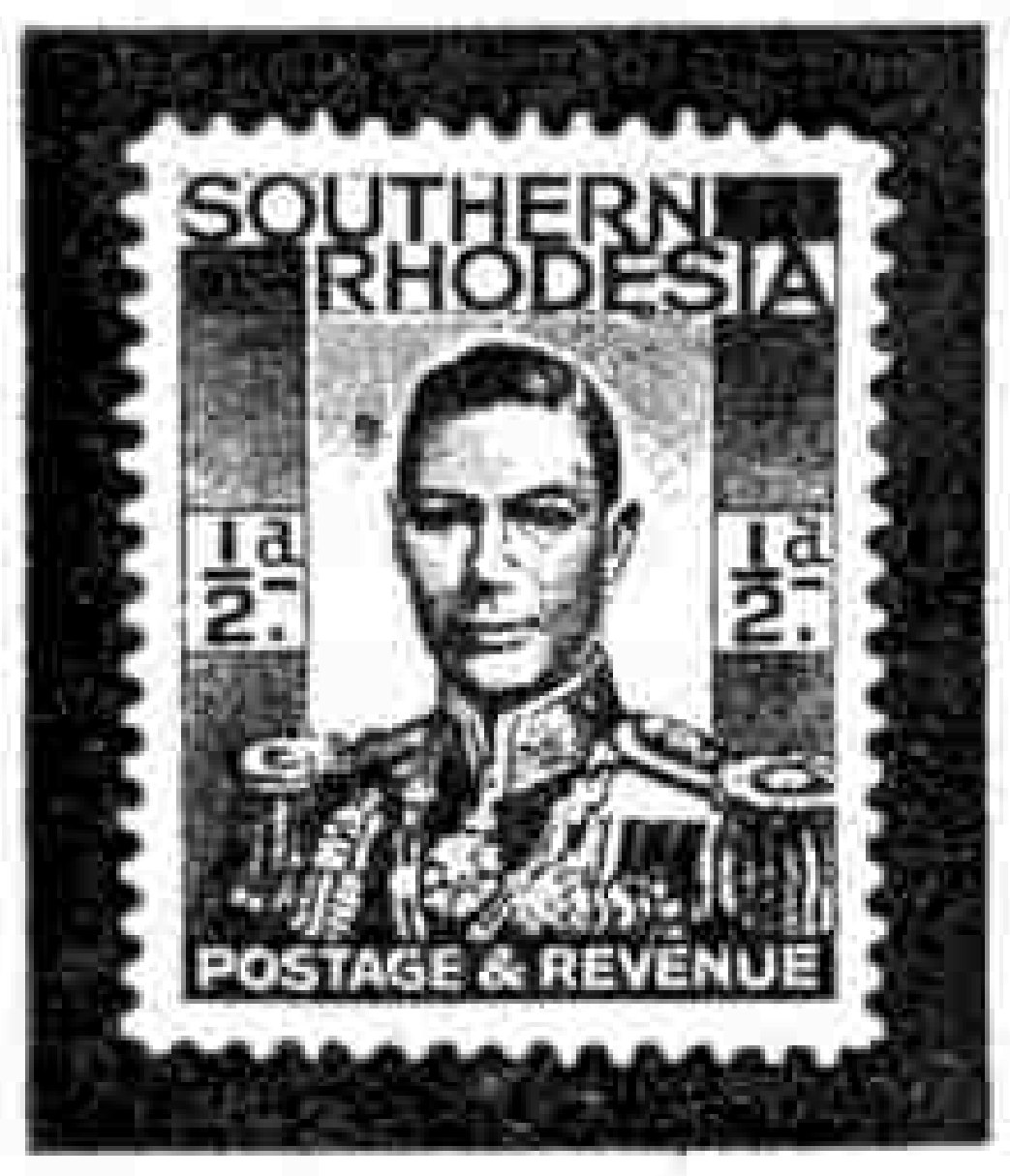


King George VI Colonial Issues

Two more Colonial series of King George VI stamps have just appeared, those for the Straits Settlements and Southern Rhodesia, and specimens from both issues are illustrated in this column. The Malaya issue is specially interesting in that it gives a right-hand profile picture of the King, a most unusual arrangement.

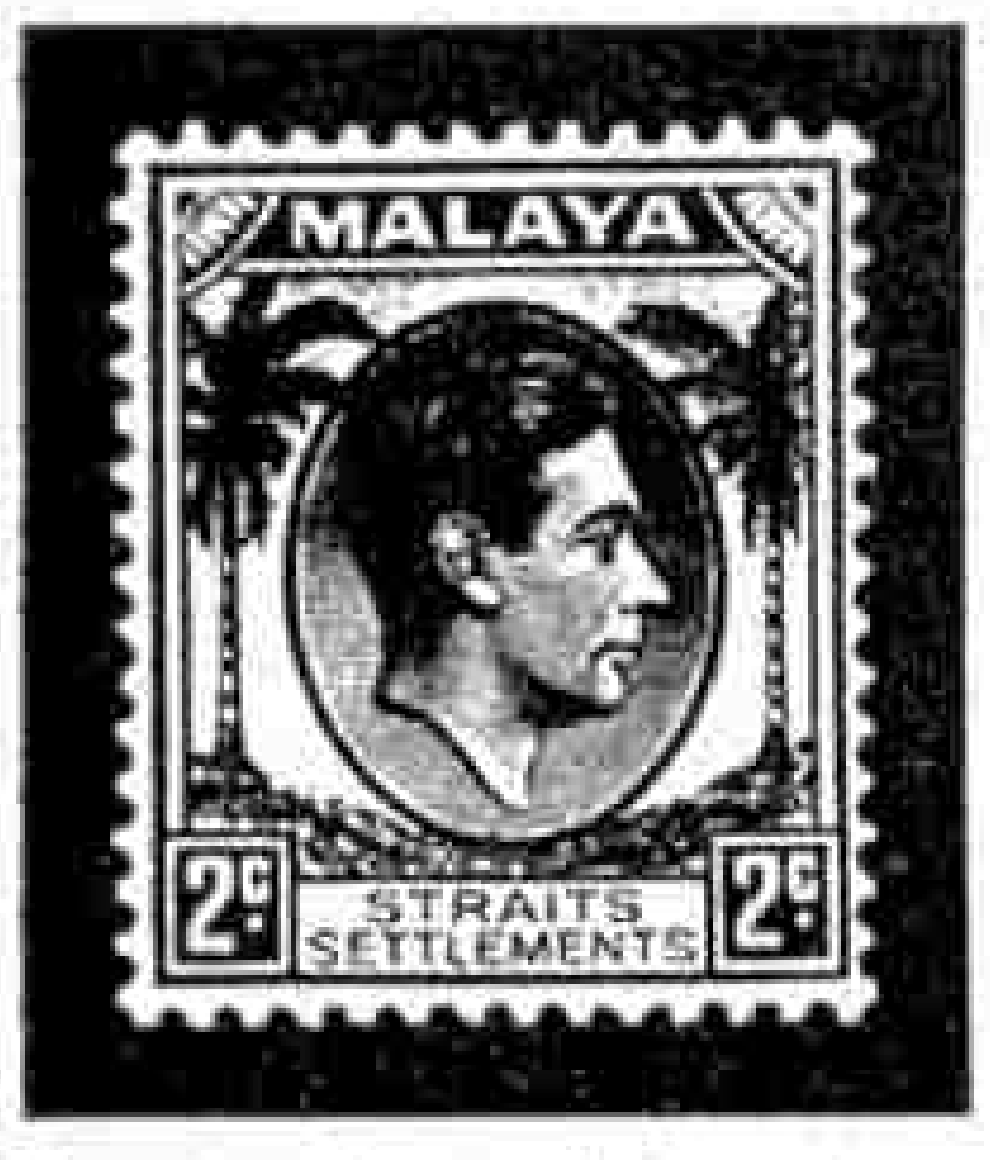
Other Colonies with new stamps in preparation are Cayman Is., New Hebrides, St. Vincent, Trinidad and the Turks Is. In all cases except the New Hebrides issue, the designs will be pictorial, with an inset medallion portrait of H.M. King George VI. Most of the pictorial designs will feature local scenes of interest.

The new Hebrides series is specially interesting, for this territory is jointly administered by Britain and France, and both the British and French postal administrations will issue new stamps.

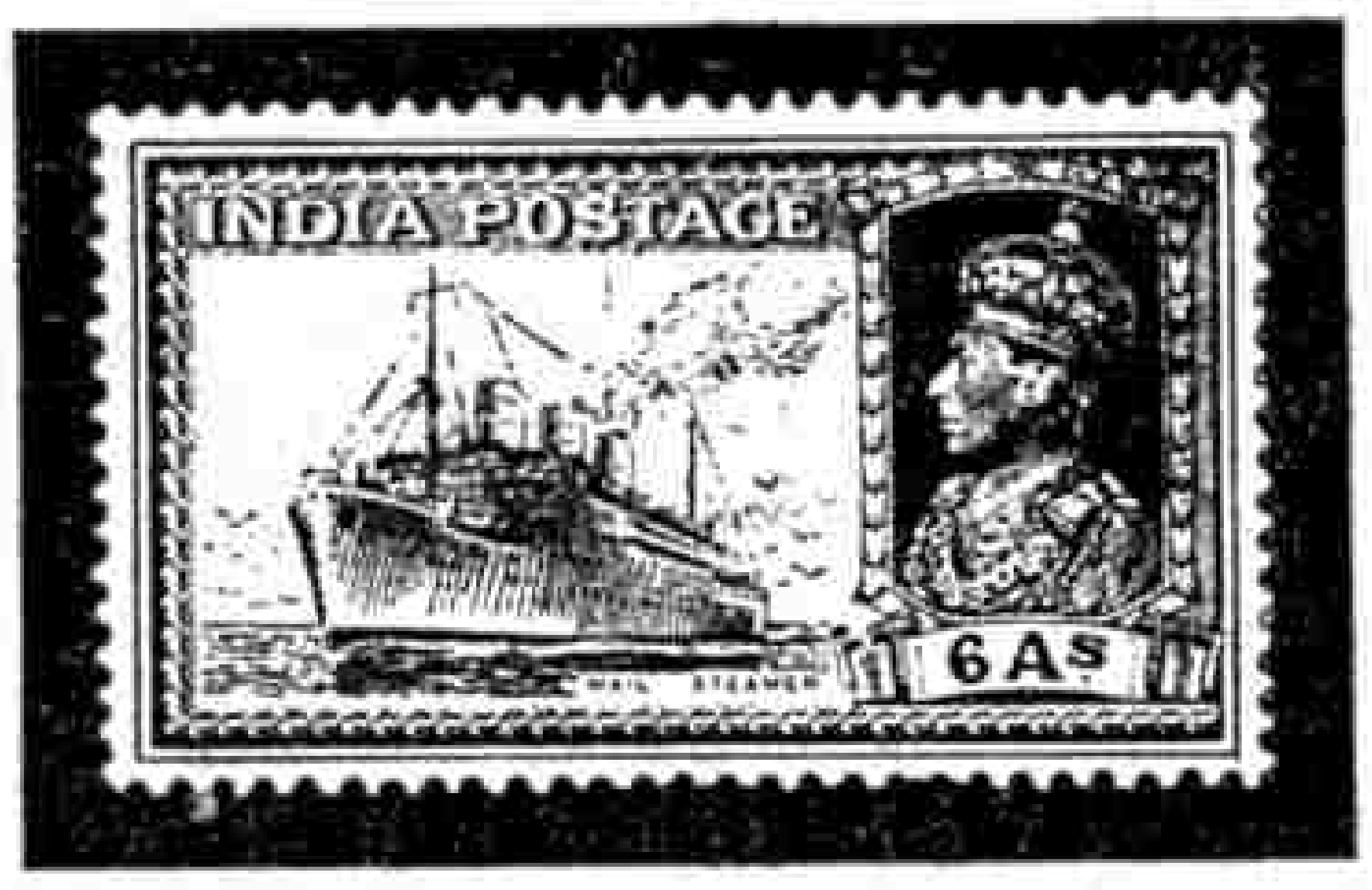


The design for both series of stamps will be the same, comprising a beach scene with panels on either side containing the British and French arms. In the British series the British and French arms will be displayed at the top right and top left-hand corners, respectively, and the title of the territory, New Hebrides, will be shown at the top. In the French series the position of the arms will be reversed, the French being in the top right and the British in the top left, and the title of the territory will be shown as Nouvelles Hebrides.

In connection with the new Southern Rhodesian issue it is interesting to know that stamps of the King George V reign will remain on sale until the present stocks are exhausted or until 31st May, whichever is the earlier. After 31st May all such stamps, except the 2d. and 3d. Victoria Falls issue, will be demonetised. The Victoria Falls issues, which first made their appearance in 1932, are to be retained as part of the regular series, and for the present there will be no issue of 2d. and 3d. values bearing the portrait of King George VI. After 31st May, letters franked with the demonetised stamps will be treated as understamped and will be surcharged accordingly before delivery to their addressees.

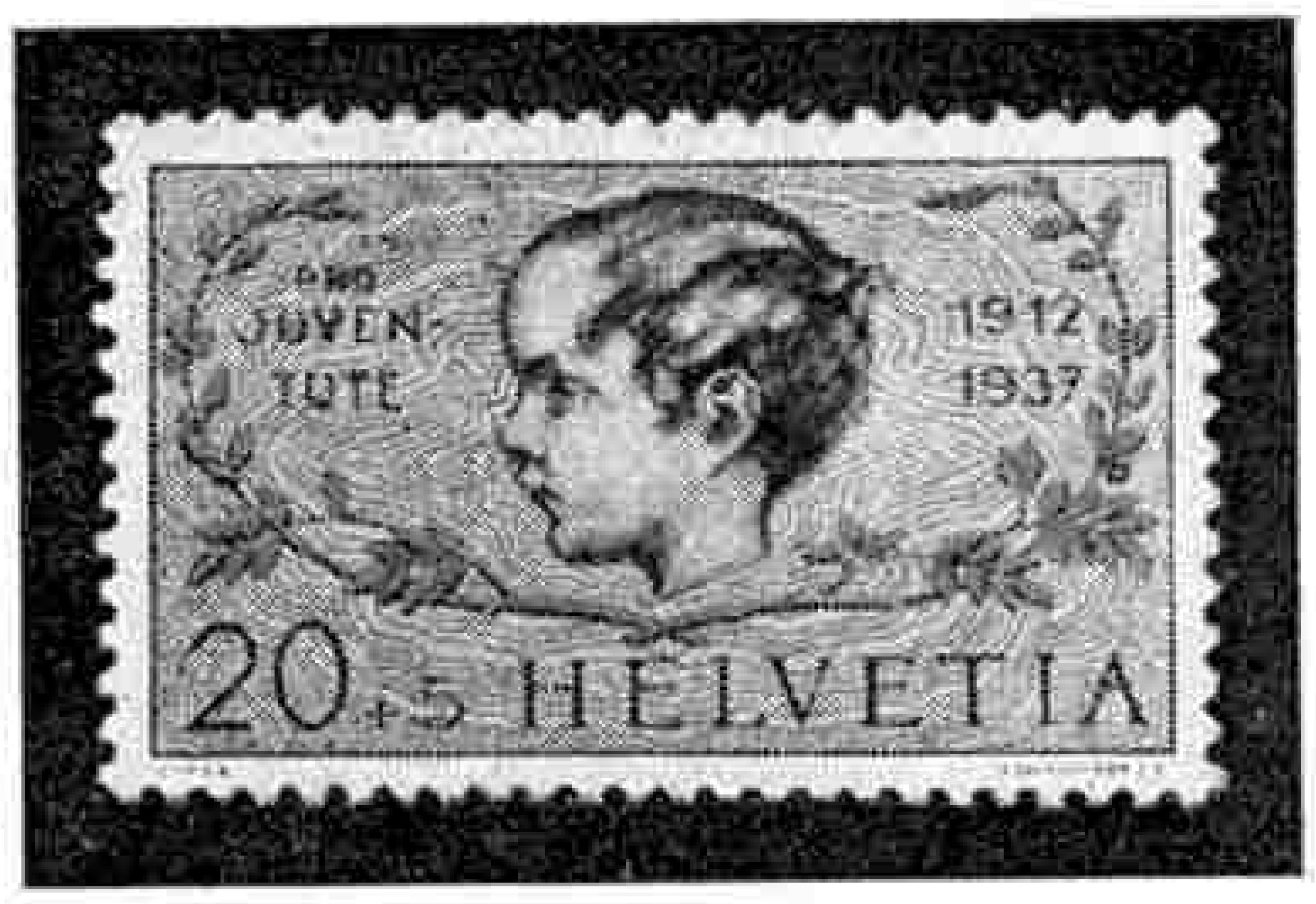


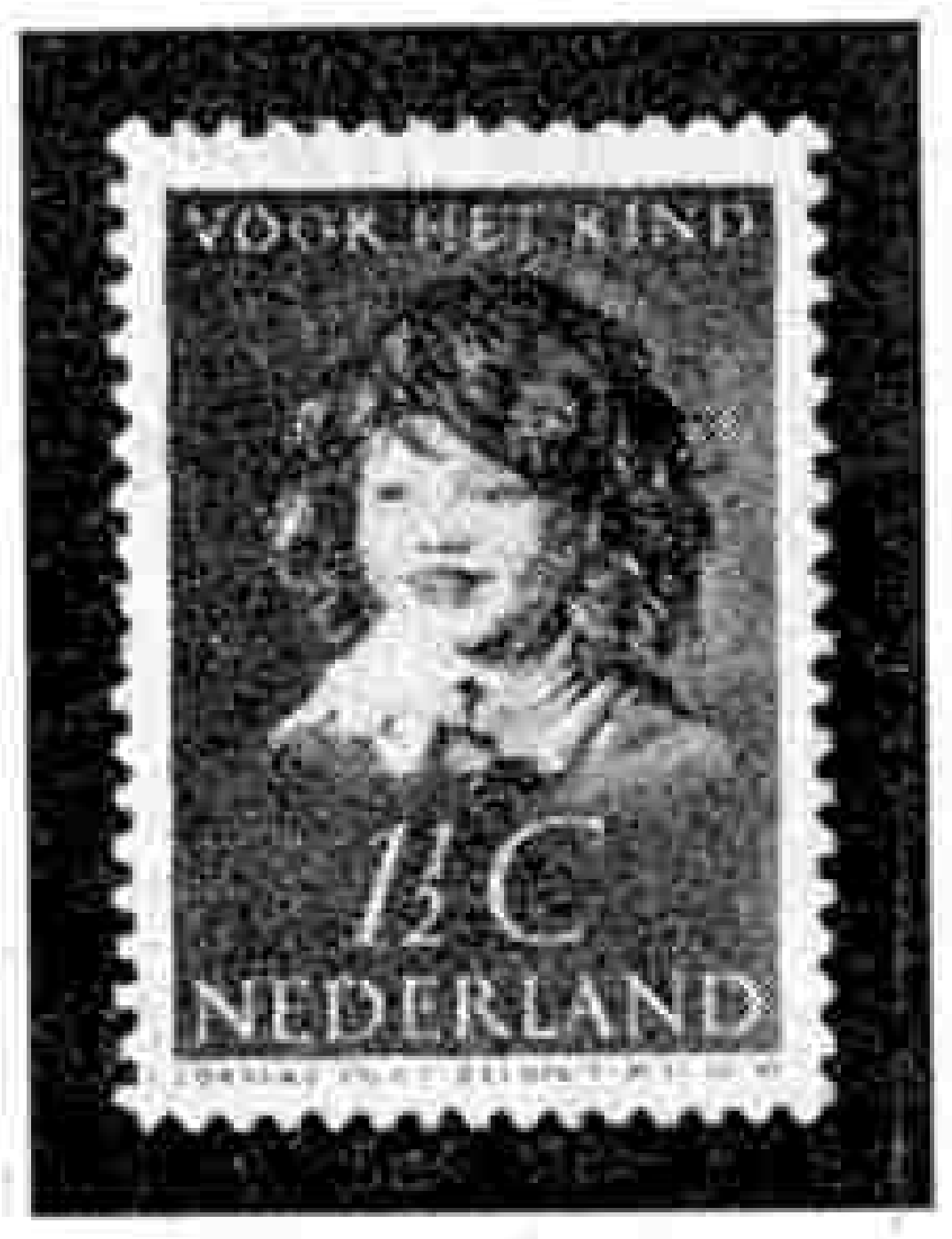
India's New Pictorials



To India falls the distinction of being the first Dominion to issue a complete series of King George VI stamps, and we are indebted to our reader, Mr. E. R. Kooka, for a set of the stamps in the special booklet issued by the Indian post office. The booklet includes a brief historic account of Indian postage stamps from the first issue in the Province of Sind in 1852 up to the present time.

The new stamps have been printed by the letterpress process, and the watermark on the paper is "Multiple Star" throughout. The four low values, 3p. to 1a., take the design described in the November "*M.M.*" but the eight higher values, two annas to 12 annas, bear pictorial designs illustrating the different methods of conveying mails in India, as follows: 2 as., Mail runner; 2 as. 6, Dak bullock cart; 3 as., Dak tonga (a light two-horse vehicle); 3 as. 6 Camel rider; 4 as., the Imperial Indian mail train; 6 as., a P. and O. mail boat; 8 as., mail lorry; 12 as. mailplane. The design for the rupee values is the same as that used for the King George V issues, but rather brighter frame colours are used.





Help the Hospitals

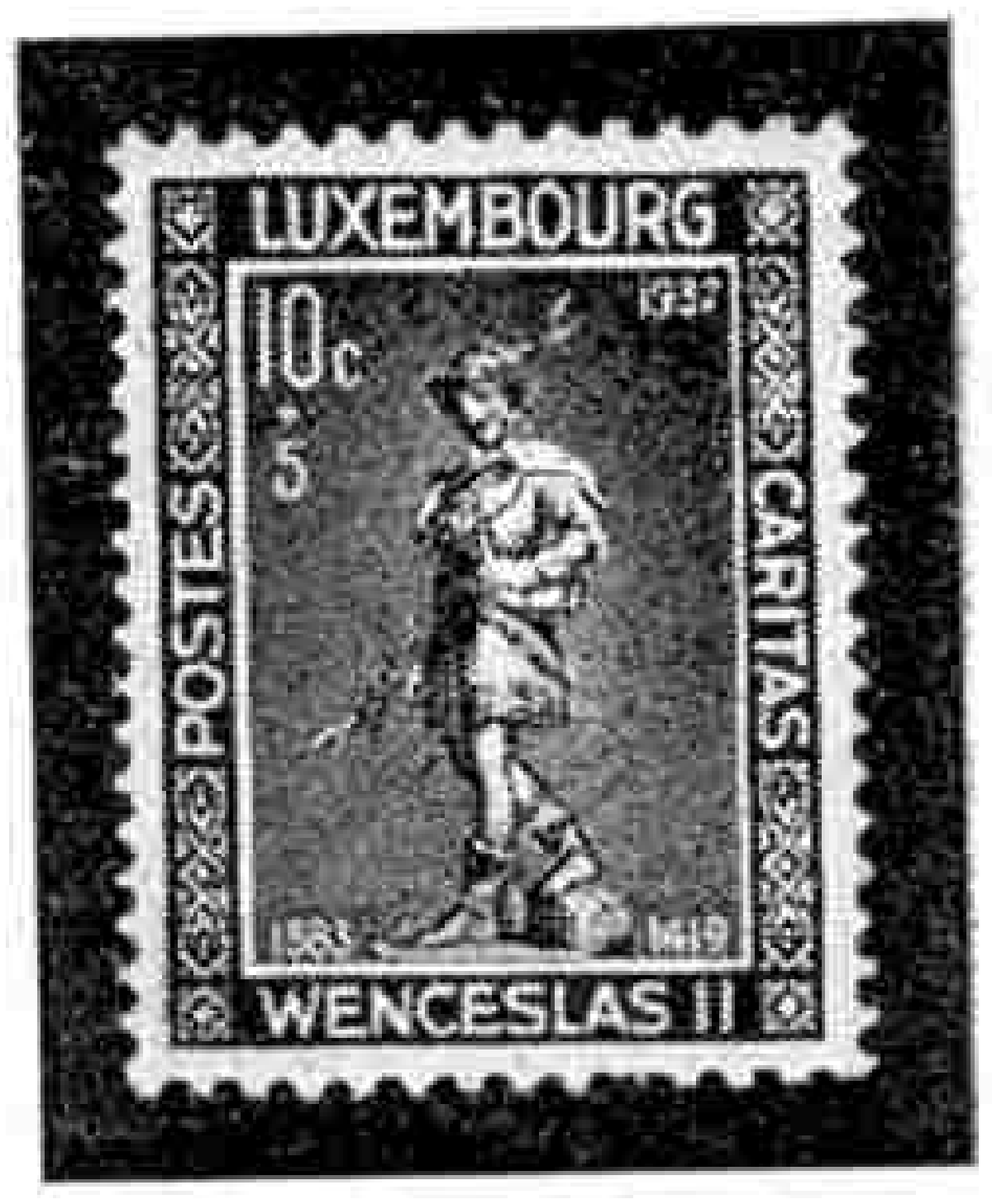
Readers who delight in bargain hunting will find special interest in the unsorted packets offered by the Woolwich Memorial Hospital. Each packet contains 75 different stamps, consisting mainly of collectors' duplicates and cuttings from envelopes provided by local business houses. We have inspected a sample packet and the contents consist mainly of modern pictorials, including several new issues and British Colonial stamps.

Readers will do themselves a good turn and will help a deserving cause by buying one of these packets, price 6d., from the Secretary, Memorial Hospital Hall, Woolwich, London, S.E.18. An addressed envelope, unstamped, should be sent with the remittance.

Christmas Charity Issues

We illustrate this month the design used for Holland's 1937 series of child welfare stamps, five of which were issued on 1st December last.

The subject of the design is the famous picture "*Laughing Boy*," by Franz Hals, which hangs in the Louvre Galleries at Paris. Hals ranks second only to Rembrandt amongst Dutch painters, and another great work of his is the "*Laughing Cavalier*," which is in the Wallace collection in London. Hals died in 1666 at the age of 86.



Following the practice of recent years the 1937 Pro-Juventute charity issues from Switzerland depict Swiss celebrities and symbolic designs. This year's issue consists of four stamps with portraits of General Henri Dufour on the 5c. value and Nicholas von der Flue on the 10c. stamp. The 20c. and 30c. take the child's head design shown here, but in the 30c. stamp the head faces to the right instead of the left.

Nicholas von der Flue has previously appeared on a Pro-Juventute stamp, the 30c. value of the 1929 series. He was a hermit who lived in the 15th century and gained so great a reputation for wisdom that he was frequently consulted upon affairs of state. General Dufour's claim to fame was that he spent over 30 years in compiling maps of Switzerland. For a time he was professor at a Swiss Military College and amongst his pupils was Louis Napoleon, later Napoleon III of France.

We also illustrate the design used for the Luxemburg charity issue. This is based on a statue showing Wenceslas II of Luxemburg, who was simultaneously Wenceslas, King of Germany, and Wenceslas IV of Bohemia. He was the son of the Emperor Charles IV, and was crowned King of Bohemia in 1363 when he was only two years of age. He married when he was only nine years old; at 15 he was elected King of Germany, and the death of his uncle, Wenceslas I, brought the Duchy of Luxemburg to his possession at the age of 22. For all that Wenceslas had little security and spent the rest of his days in conflict with his nobles.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

An L.N.E.R. Milepost Curiosity

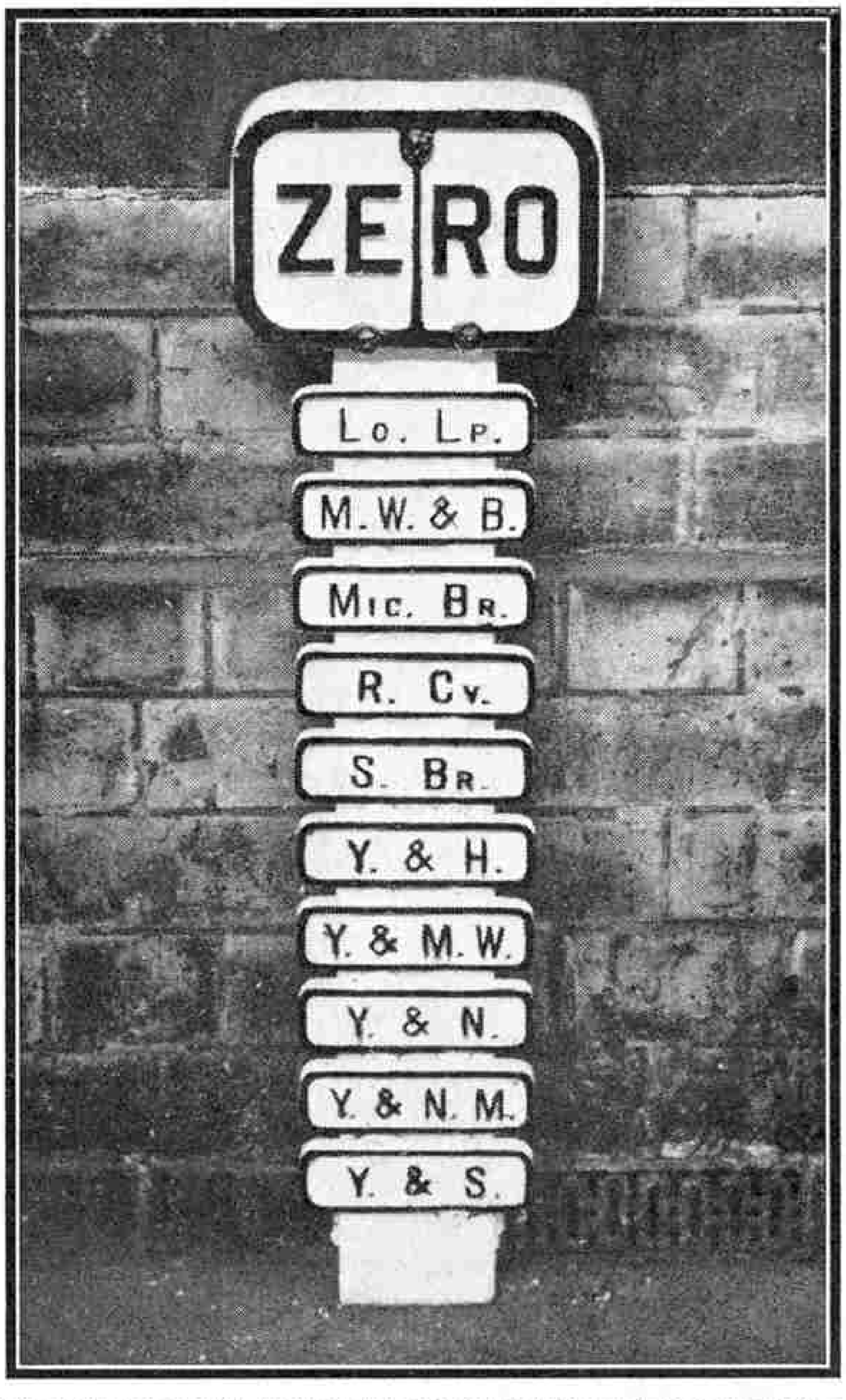
The Zero Post at York

MILEPOSTS are familiar features of the lineside, dividing each route into quarter miles. They vary to a surprising extent in size and design according to their age, and to the practice of the individual companies that set them up. Some of them are small and more or less undistinguished in appearance. Others are fairly large, and those to be found on the former L.N.W.R. main line are giants that must ease considerably the work of train-timing enthusiasts on this route!

A curiosity in mileposts on which no figures at all are shown is seen in the photograph on this page. Ordinarily we can scarcely imagine a milepost bearing the indication *"O,"* but the post in the photograph, which is on the L.N.E.R., forms the nearest approach in displaying the word *"Zero."* This zero post is situated at York and is the point from which mileages are measured on various North Eastern Area lines radiating from there.

Below the plate displaying the word *"Zero"* appear some mysterious-looking initials and abbreviations in a succession of panels. Actually they stand for the different routes for which the post forms a zero point, and on seeing them we cannot fail to be struck by the importance of York literally as a railway centre.

The first indication "below zero," *"Lo.Lp,"* is an abbreviation, and stands for the Longlands Loop at Northallerton. The second indication consists of letters *"M.W. & B"* which form the initials of "Market Weighton and Beverley." The line connecting these two places links the line between Hull and Driffield with that connecting Driffield and Selby.



The zero post at York. It forms the point from which various routes in the North Eastern Area of the L.N.E.R. are measured. Photograph by courtesy of the L.N.E.R.

In the next indication a return is made to abbreviations, and *"Mic. Br."* refers to the Micklefield branch. This is a connecting line between Micklefield, on the route from Leeds to Selby, and Church Fenton, where the Harrogate and York routes from Leeds diverge. After the next two indications, which stand for "Raskelf Curve" and "Sherburn Branch" respectively, a return is made to initial letters.

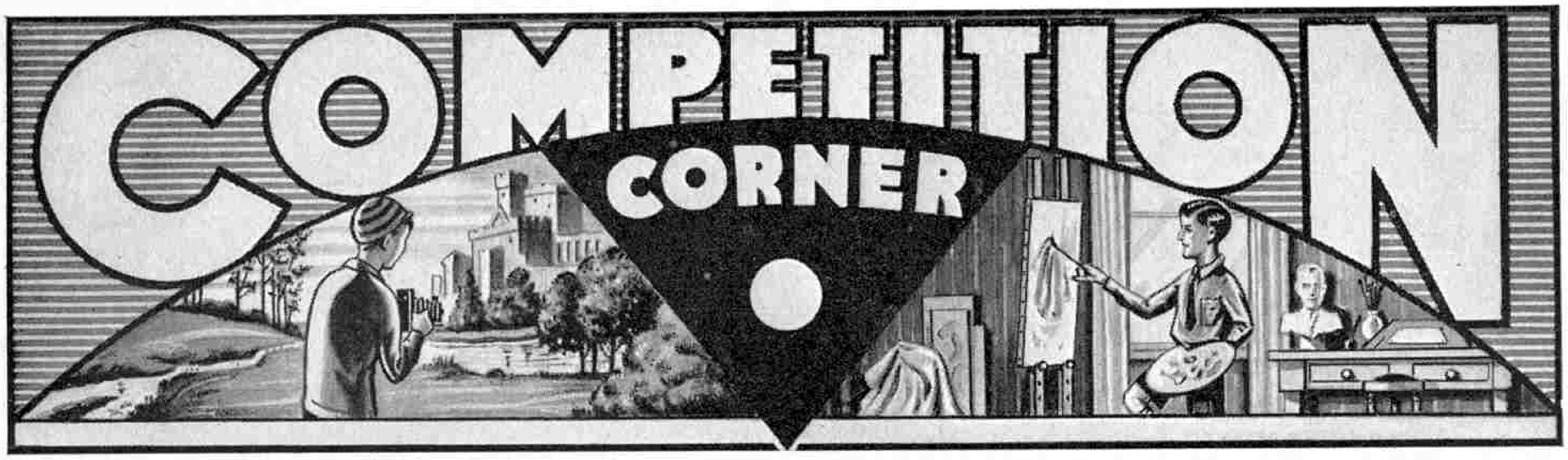
Each of the remaining indications stands for a more or less complete route, the first of these being the York and Harrogate line indicated by *"Y. and H."* This diverges from the main East Coast Route at Poppleton. It passes historic Marston Moor, the scene of the battle in the Civil War, before joining up at Knaresboro' with the line from Pilmoor to Harrogate. It is between Pilmoor and Knaresboro' that the L.N.E.R. have in use the interesting experimental signalling system that was referred to in the *"M.M."* in March 1935. Signal boards of different kinds are employed in place of the usual home and distant signals. At night the "location board" corresponding to the distant signal is sighted by the aid of powerful electric headlamps in the engine. The "home" board has a central flap that displays a green centre in daylight when the line is clear; at night a green light is exhibited.

The seventh line indicated is the branch from York to Market Weighton which connects at the latter place with the Beverley, Driffield and Selby lines referred to previously, in connection with the "M.W. & B." indication. It was opened in 1847 by the then York and North Midland Railway.

The longest and most important route indicated is the main line from York to Newcastle, for which the initials *"Y. & N."* are used. This has a length of over 80 miles, and forms the pathway of such famous trains as *"Coronation," "The Silver Jubilee"* and *"The Flying Scotsman"* across the Plain of York and through the industrial area of County Durham to busy Tyneside.

The next indication is historic in a railway sense, for it refers to that portion of the original York and North Midland Railway covered by the main line to the South in the direction of Normanton. This railway company was formed in 1835 by the union of two companies, the York and Leeds, and the North Midland. George Stephenson was its engineer and its first chairman was George Hudson, the "Railway King" of a century ago. It was one of the constituent companies that amalgamated to form the North Eastern Railway in 1854. It now forms the present-day route from York through Church Fenton and Burton Salmon to Normanton.

Finally we have *"Y. & S."* referring to the York and Scarborough line. This branches off at the north end of York station and cuts across in a north-easterly direction through Malton and Seamer. It was opened in 1845 as part of the North and North Midland line. The occasion was marked with great celebrations in York and large numbers of free tickets were distributed.



ANIMALESQUES

In this competition readers are invited to discover for themselves a series of museum freaks—mainly zoological—that were first seen by Pawl, the famous Meccano office boy, in a nightmare. Pawl's description of these oddities was "half like animals and half like goodness-knows-what," and we have named them "Animalesques."

The nature of the freaks can be discovered from the clues in the accompanying panel. Each name is divided into two parts, the first the name of a well-known animal, bird, insect, reptile or fish, and the second a common English word that may or may not be the name of such a creature. The last three letters of the first part of each name are also the first three letters of the second part. The clues indicate the two parts.

As an example, let us take the first animalesque in the list. The first clue is "A species of parrot"; the second clue is "Make odd notes on a flute." These clues indicate "Cockatoo" and "Tootle" respectively. The last three letters of "Cockatoo" are also the first three letters of "Tootle," and thus the creature stands revealed as a "Cockatootle!"

Prizes of Meccano products—this expression covers all articles included in the current Meccano and Hornby Train catalogue—value 21/-, 15/-, 10/6 and 5/- are offered to the four readers who submit the best attempts to name the full set of 24 "Animalesques," in each of the two sections, Home and Overseas.

In the event of no one succeeding in solving the complete list of names the prizes will be awarded to the next best entries. There will be a number of consolation prizes and in the event of a tie for any or all of the prizes the judges will take into account neatness and novelty of presentation.

Entries should be addressed to "*Animalesques*, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 28th February. Entries from Overseas readers must arrive not later than May 31st.

	Clue to first part.	**Clue to second part.**
1.	**A species of parrot.**	**Make odd notes on a flute.**
2.	**An insect with a nasty sting.**	**This plant has one too.**
3.	**A long winged seabird.**	**A Gallic poet.**
4.	**An ass in a striped coat.**	**This holds a watchman's fire.**
5.	**A bull-like wild animal.**	**Musical composition.**
6.	**A large bird with a curious bill.**	**A deceiving appearance.**
7.	**A male goose.**	**Scorn.**
8.	**A hairy grub.**	**Throat.**
9.	**A large animal of the cat family.**	**This is difficult.**
10.	**Creature that turns.**	**Gilt or bronze metallic ware.**
11.	**An animal of the stoat family.**	**A chemical element.**
12.	**A tiny bird.**	**Tiny thing.**
13.	**A male ass.**	**Murderer.**
14.	**Amphibious rodent.**	**Covered balcony.**
15.	**A large water fowl.**	**Annul.**
16.	**The king of fish.**	**A mischievous animal.**
17.	**A trained bird of prey.**	**A large vulture.**
18.	**A little animal that lives on trees.**	**Pertinent.**
19.	**A species of antelope.**	**Slow even musical measure.**
20.	**A thick-tongued lizard.**	**A large water snake.**
21.	**A young rooster.**	**Like.**
22.	**A long-legged bird.**	**A fish found on the Pacific coasts.**
23.	**A prehistoric reptile.**	**Wild ox.**
24.	**A German dog famous for its short legs.**	**The lower sky.**

February Drawing Contest

Each month throughout this winter we are offering prizes for the best drawings or paintings submitted during the month. There are no restrictions as to subject or to size. The entries each month are divided into the usual two sections, A for readers aged 16 and over, B for those under 16, and prizes of Meccano products to the value of 21/- and 10/6 will be awarded for the best entries in each section. In each contest a separate set of prizes, to be awarded in similar conditions, is reserved for competitors in the Overseas section.

Entries in the February competition must be addressed "*February Drawing Contest*, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 28th February. Overseas closing date, 31st May.

Unsuccessful entries will be returned if a stamped cover is sent for the purpose.

Competition Closing Dates

HOME	
"Animalesques" Contest ...	**28th February**
February Drawing Contest ...	**28th February**
OVERSEAS	
"Hidden Proverbs" Contest ...	**28th February**
November Drawing Contest ...	**28th February**
Advertisement "Jig-Saw" Contest	**31st March**
Stamp Voting Contest	**31st March**
December Drawing Contest ...	**31st March**
January Drawing Contest ...	**30th April**
"Cover Voting" Contest... ...	**30th April**
"Animalesques" Contest ...	**31st May**
February Drawing Contest ...	**31st May**

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

Entrants to drawing and similar competitions should note that unsuccessful entries can only be returned if a stamped addressed cover is sent with the entry.

COMPETITION RESULTS

HOME

"Stamp Voting" Contest.—1. A. Swindells (Salford, 7). 2. L. I. Butler (St. Helens). 3. K. Haley (Witney). 4. J. G. Turnbull (Ilford). Consolation Prizes: C. Ayles (Troon); D. Fairweather (Arbroath); R. Hogben (River); I. G. Hunt (Wembley).

December Drawing Contest.—First Prizes: Section A, H. Hutchinson (Wath-on-Dearne); Section B, A. Stewart (Jarrow). Second Prizes: Section A, E. H. Taylor (Bristol, 3); Section B, S. Jones (Chester). Consolation Prizes: F. C. Bent (Disley); A. Symonds (Coventry); K. Thwaites (Sutton).

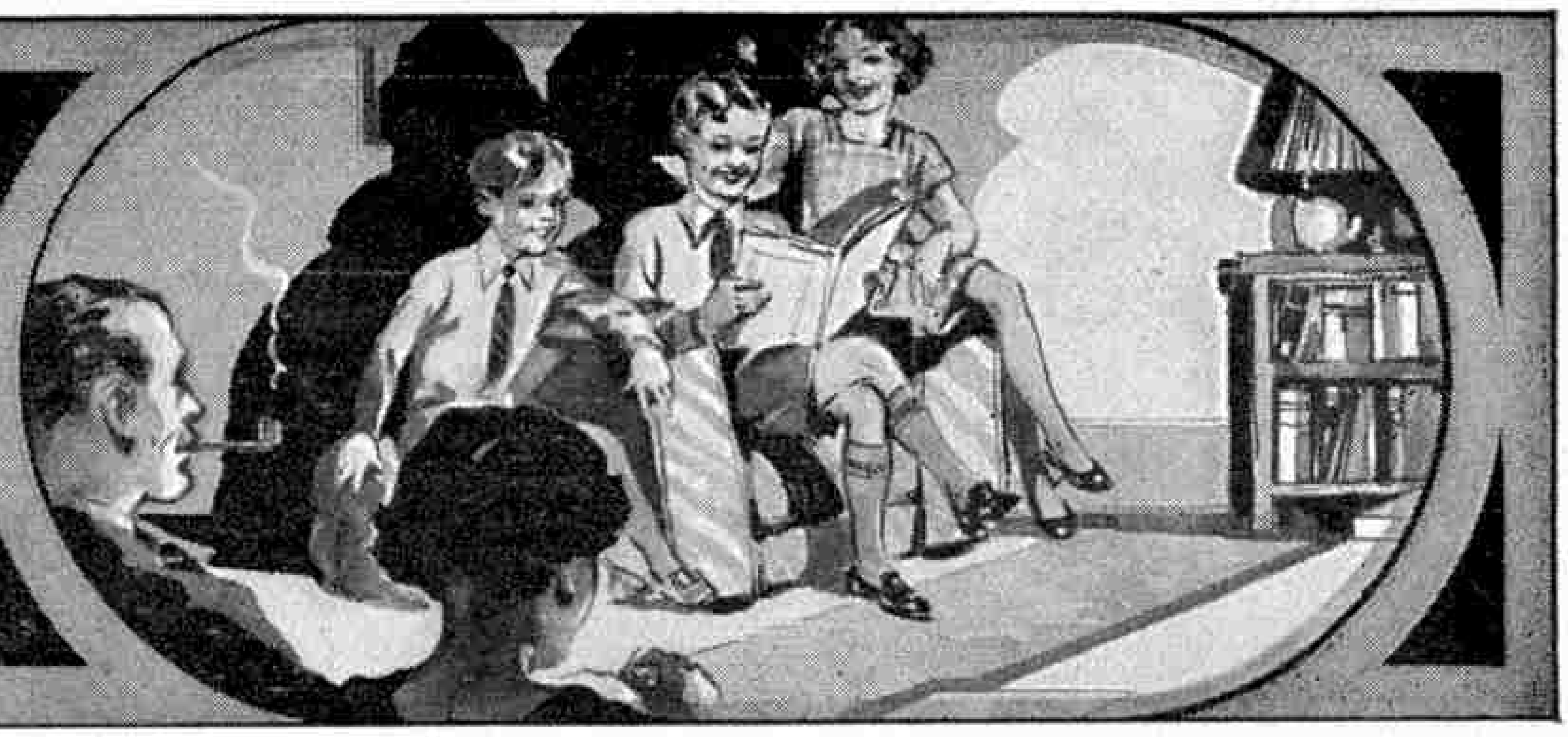
Advertisement "Jig-Saw" Contest.—1. D. Morley Davies (Maesteg). 2. A. New (New Barnet). 3. W. A. Bradshaw (Sheffield, 9). 4. F. Mills (Kearsley). Special Prize, R. J. Biggs (Bristol, 6). Consolation Prizes: L. W. Chitty (London, S.W.20); K. Costain (Bolton); M. W. Dolton (Biddenham).

OVERSEAS

September Photo Contest.—First Prizes: Section A, C. W. Beese (Hamilton, Ont.); Section B, B. F. Williams (Montreal). Second Prizes: Section A, F. Schorrewegen (Lierre, Belgium); Section B, F. V. Gatt (Balgan. Malta). Special Prize: G. Papa (Naples, Italy). Consolation Prize: J. Fatimehin (Ibadan).

"Point Words" Contest.—1. S. P. Scott (East London, S. Africa). 2. D. J. White (Christchurch). 3. E. A. Bunt (Capetown). 4. J. S. Hall (Johannesburg). Consolation Prize: E. K. Shorrock (Vancouver).

FIRESIDE FUN



ARTFUL ANGLER

Jakes had poor luck fishing, so on his way home he entered a fish shop and said to the dealer:

"Just stand over there and throw me five large mackerel."

"Throw 'em! What for?" asked the dealer in amazement.

"So that I can tell my friends I caught 'em."

* * * *

Customer: "This photograph makes me look older than I really am."

Photographer: "Well, that will save you the expense of having one taken later on."

* * * *

Teacher: "Johnny, give me three examples of a collective noun."

Johnny: "Flypaper, a wastepaper basket and a dust bin."

* * * *

Housewife: "So you find it impossible to get any work. What particular kind of work do you do?"

Tired Tim: "Lady, I weed winder-boxes!"

* * * *

Nephew: "What were you in the great war, Uncle?"

Uncle: "Battery sergeant-major, my boy."

Nephew: "High or low tension, Uncle?"

* * * *

Bill: "You look as though a goat has been chasing you."

Jim: "Chasing me? He caught up with me."

* * * *

Mother: "Now if you two children can't agree I shall take the sweets away from you."

Johnny: "But we do agree, mum. Leslie wants the most, and so do I."

* * * *

Tom: "What's the difference between a horse's mane and a pirate with a sore throat?"

Frank: "I dunno."

Tom: "One is coarse horse hair and the other is a hoarse corsair."

* * * *

Patient: "What is your favourite winter sport, Doctor?"

Doctor: "Sleighing."

Patient: "Yes, but I mean apart from business."

* * * *

Judge: "What is your business?"

Prisoner: "I am a locksmith, your Honour."

Judge: "What were you doing when the place was raided?"

Prisoner: "I was making a bolt for the door."

* * * *

HOPEFUL

Father: "Well, I've rung three times and there doesn't seem to be any answer."

Small Boy: "I wonder if he's dead!"

FOREIGN INFLUENCE

Binks: "This is the sunset my daughter painted. She studied abroad, you know."

Jinks: "Ah, that accounts for it. I never saw a sunset like that in this country."

* * * *

The master was telling the class how to find the area of the walls, ceiling and floor of a room.

"If we take the ceiling and floor away, what will we have?" he asked.

"Please, sir," said a small boy, "a draught."

* * * *

TWICE NOTHING

Passer-by to Angler: "Having much luck?"

Angler: "Pretty good, I haven't had a bite for three hours."

Passer-by: "What's so good about that?"

Angler: "Well, that guy over there hasn't had a bite for six hours."

* * * *

Distant Voice: "Are you Exchange 4372?"

Telephone Subscriber: "No, but yours is the nearest guess to-day so far."

* * * *

Pat: "I snore so loud that I wake myself up. What do you advise me to do?"

Mike: "Sleep in the next room."

* * * *

Suspicious-looking Caller: "Is the guv'nor at home?"

Maid (alone in the house): "Ye-es, er, he's in the drawing room feeding his herd of bloodhounds."

* * * *

The page boy had just carried the guest's luggage to his bedroom.

"Now, my boy," said the man, "What's your name?"

"James Ready, sir," replied the boy, "but they call me Billiard Cue because I work better with a tip."

* * * *

A man bought a canary from an animal dealer.

"You're sure this bird can sing?" he said, suspiciously.

"He's a grand singer."

The customer left. A week later he reappeared.

"Say! This bird you sold me is lame!"

"Well, what did you want? A singer or a dancer?"

* * * *

American: "Your trains go slowly. Why, some of ours go at the rate of 100 miles an hour!"

Englishman: "That's nothing! Once I took a first-class ticket to Birmingham and went in a second."

* * * *

Bloggs: "Would you like to go in for a raffle for an old sailor?"

Binks: "No, thanks. I wouldn't know what to do with an old sailor if I won him."

* * * *

THIS MONTH'S HOWLER

Contralto is the name of a low sort of music that only ladies sing.

CAREFUL

"Is he economical?"

"Why, he is so thrifty that he has postponed buying an atlas until world affairs are more settled."

* * * *

"Casey," said Pat, "how do ye tell the age of a turkey?"

"Oi can always tell by the teeth," said Casey.

"But a turkey hasn't any teeth that oi've ever heard of."

"No," admitted Casey, "but oi have."

* * * *

Master: "Well Smith, what is a tissue?"

Smith: "A sneeze, sir."

* * * *

An American car suddenly stopped in a Warwickshire road, opposite an old countryman.

"Say," said the driver, "kin you tell me if I am right for W. Shakespeare's house?"

"Yessir," replied the yokel, "but there bain't no need to hurry—he's dead!"

* * * *

The very slow train pulled up.

"What's the reason for the delay, guard?" asked an angry passenger.

"Nothing much, sir," said the guard. "A cow has strayed on to the line."

A mile or so farther on the train came to a standstill again. The same passenger's head was thrust out of the carriage window.

"What's the matter this time?" he roared.

"It's quite all right, sir," said the guard. "We've just caught that cow up again."

* * * *

Jack: "Have you heard the story about the taxi-driver who ran over himself?"

Joe: "No! How did it happen?"

Jack: "He asked a boy to run over to a shop to get a paper for him: the boy refused, so the taxi-driver ran over himself!"

* * * *

Mother: "Well, Tommy, how are you getting on at school?"

Tommy: "Splendid, mother; even the master says he cannot teach me anything."

* * * *

Gentleman, filling in insurance form: "It sez 'ere, 'Any Insanity in the family'?"

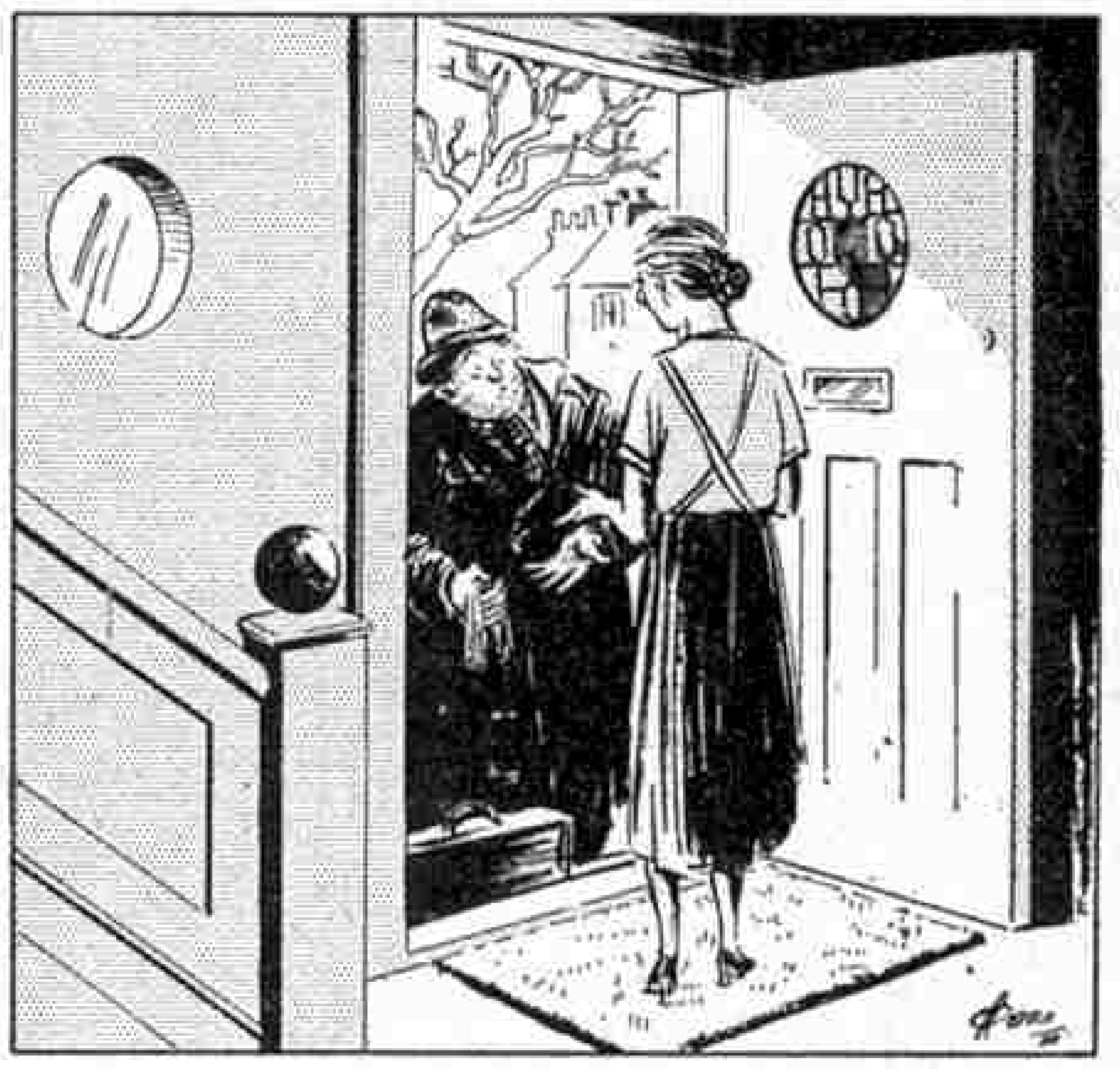
Lady: "Well, put 'No' of course."

He: "'Ow about Uncle 'Orace wots in the asylum and keeps saying 'e's Napoleon?"

She: "Yer don't want to take no notice of 'im, 'e's potty!"

* * * *

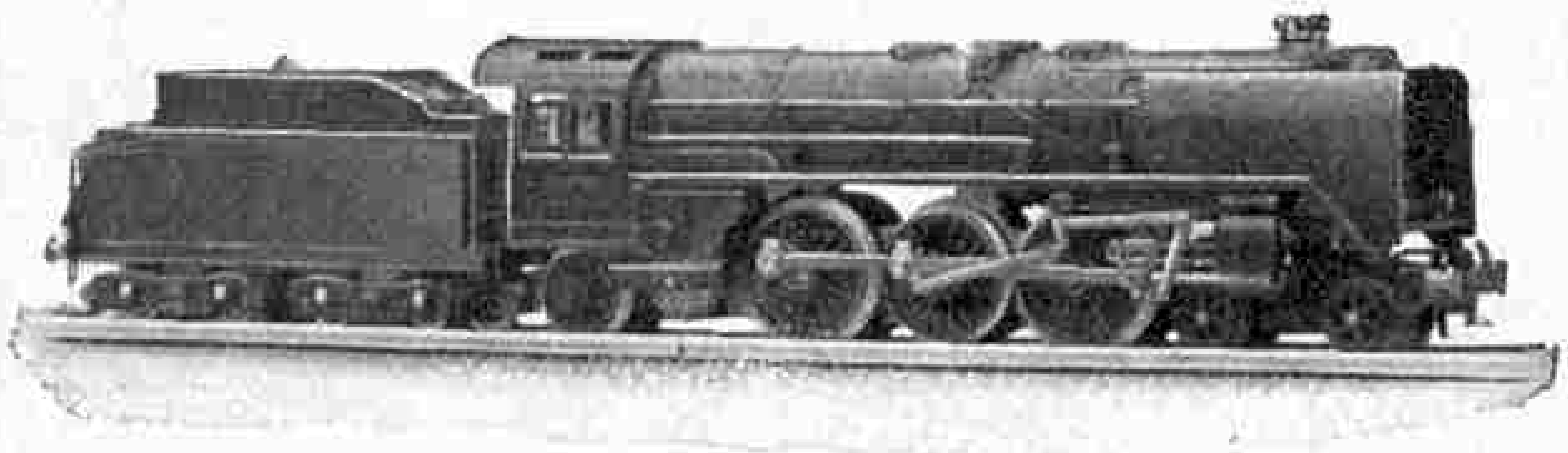
BIG GAME HUNTING



Lady: "Your shoelaces are very dear."

Pedlar: "Ah, lady, but those are genuine mohair, and you wouldn't say they was dear if you knew the ways of the Mo and 'ow difficult 'e is to catch."

SUPER DETAIL MODELS AT POPULAR PRICES



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The ever increasing popularity of "00" gauge has made Express Locomotives a necessity for the Twin Train Table Railway.

Here is a 4-6-2 Pacific type locomotive of scale model dimensions. Walschaerts Valve gear, Headlight to light up, continuous lubrication, automatic couplings, 8-wheeled tender, overall length 10¾ in. and will negotiate a 27 in. diameter circle, 14 volts a.c., 12 volts d.c. A marvellous precision production (foreign.) Price **65/-** For the fullest particulars of this and other super-detail gauge "00" productions send for **T.T.17,** the Twin Train Folder, and be up-to-date with your "00" gauge layout.

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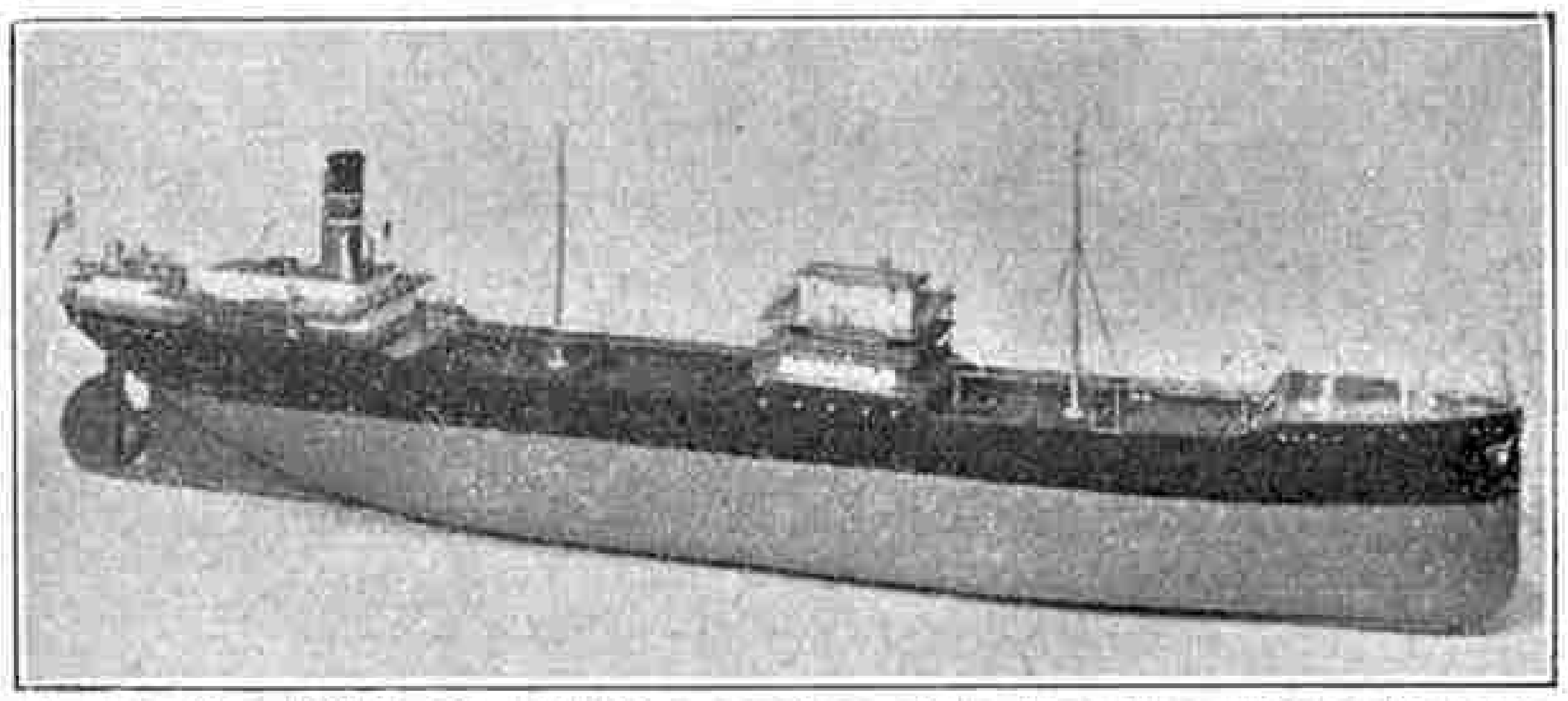
Hundreds of fascinating things for the Ship Lover are given in **S.17.** Send for this splendid Ship Model Catalogue now. **6d.** post free.

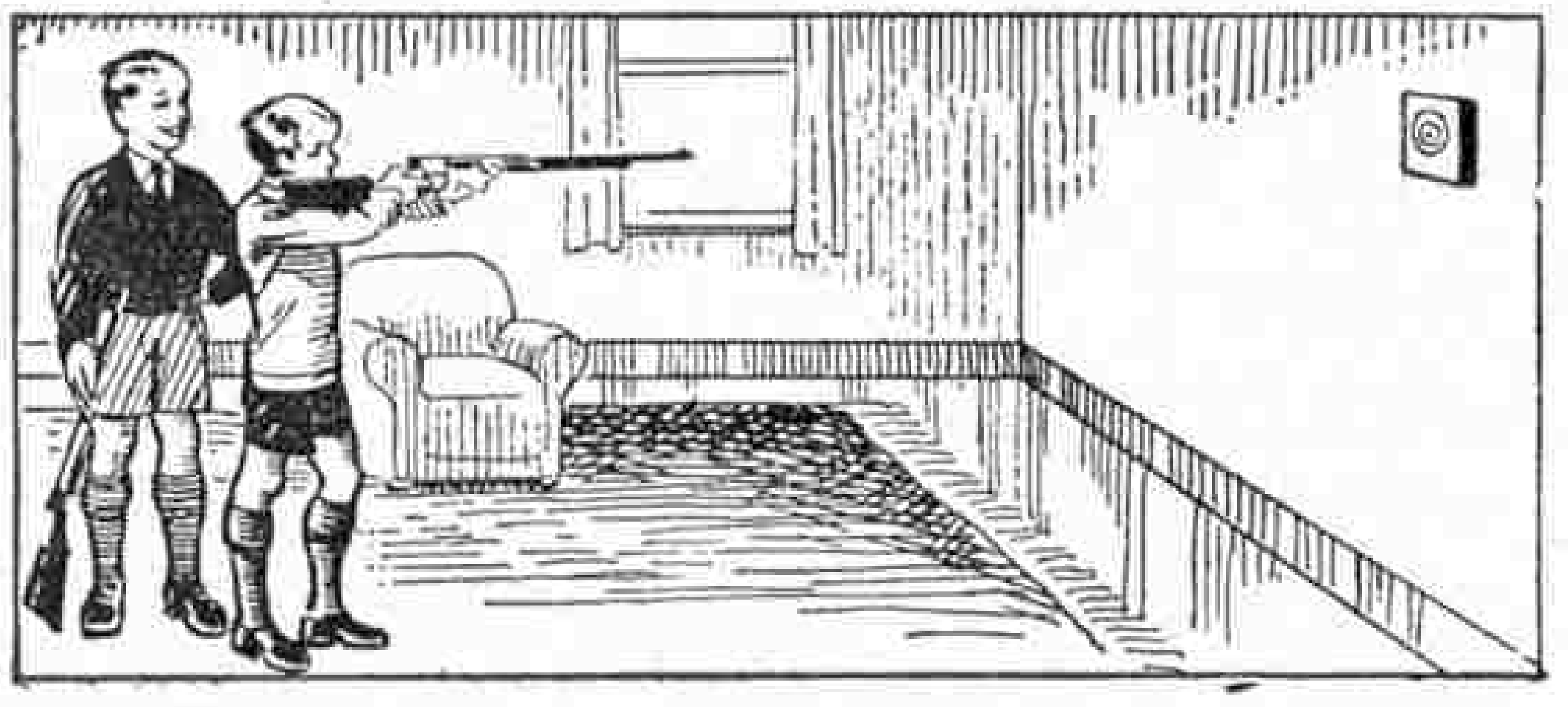


Illustrated is a MODEL OIL TANKER, a specimen of the latest type of fast and modern Oil-carrying Ship. Since the coming of the oil-driven ship, these Tankers are always in the picture of sea-going life. Length of model, 30 in. Clockwork or Electric. Price **£9 9s. 0d.** Complete in wooden box.

BASSETT-LOWKE LTD., NORTHAMPTON

LONDON: 112, High Holborn, W.C.1

MANCHESTER: 28, Corporation Street



Boys! Learn to shoot
with a
B.S.A. Air Rifle

Become a first-class marksman—get Dad to buy you a B.S.A. Air Rifle, it will enable you to enjoy the thrill of being a really good shot.

The barrel of a B.S.A. is rifled with the same care and precision as a military rifle—ensuring perfect accuracy and power. This feature, combined with the fact that a B.S.A. Air Rifle makes practically no noise and has practically no "kick" makes it particularly suitable for the beginner.

The B.S.A. Air Rifle can be used for indoor target practice if used with the B.S.A. Target Holder, and is ideal for ridding the garden of rats and other pests. B.S.A. Lead Pellets, the only ammunition used, cost but 2/7 per 1,000. Post the coupon for full details.

From £2.10s. or 4/8 a month

POST THIS COUPON NOW

B.S.A. Guns Ltd., 92, Armoury Road, Birmingham 11.
Please send details of B.S.A. Air Rifles.

Name...

Address

KEEP YOUR FAMILY TOGETHER *with* RILEY HOME BILLIARDS

8/– DOWN brings you prompt delivery of a Riley "Home" Billiard Table which will solve all leisure time problems for your family and friends. Pay balance monthly as you play. 7 days' Free Trial. Carriage paid. Rileys "Home" Billiard Table rests easily on ordinary table. Full range of sizes and prices.

4 ft. 4 ins.	×	2 ft. 4 ins.	£7 0 0	or in 20 monthly payments of	8/–
5 ft. 4 ins.	×	2 ft. 10 ins.	£9 0 0		10/3
6 ft. 4 ins.	×	3 ft. 4 ins.	£11 15 0		13/3
7 ft. 4 ins.	×	3 ft. 10 ins.	£15 0 0		17/–
8 ft. 4 ins.	×	4 ft. 4 ins.	£21 10 0		24/6

QΦ

Riley "Cabriole" Model "Combine" Table. 6 ft. size. £34-10-0, or easy terms.

Rileys are the largest makers of full size billiard tables in Gt. Britain. Also specialists in second-hand tables, accessories, repairs, etc.

RILEY "COMBINE"

BILLIARD AND DINING TABLE

Bring a new charm to your home with a Riley "Combine." Ready for either use in two minutes. Many attractive designs, oak or mahogany, with a size for any house. Cash prices from £22-10-0 upwards, or on easy monthly terms, delivery on first payment, carriage paid.

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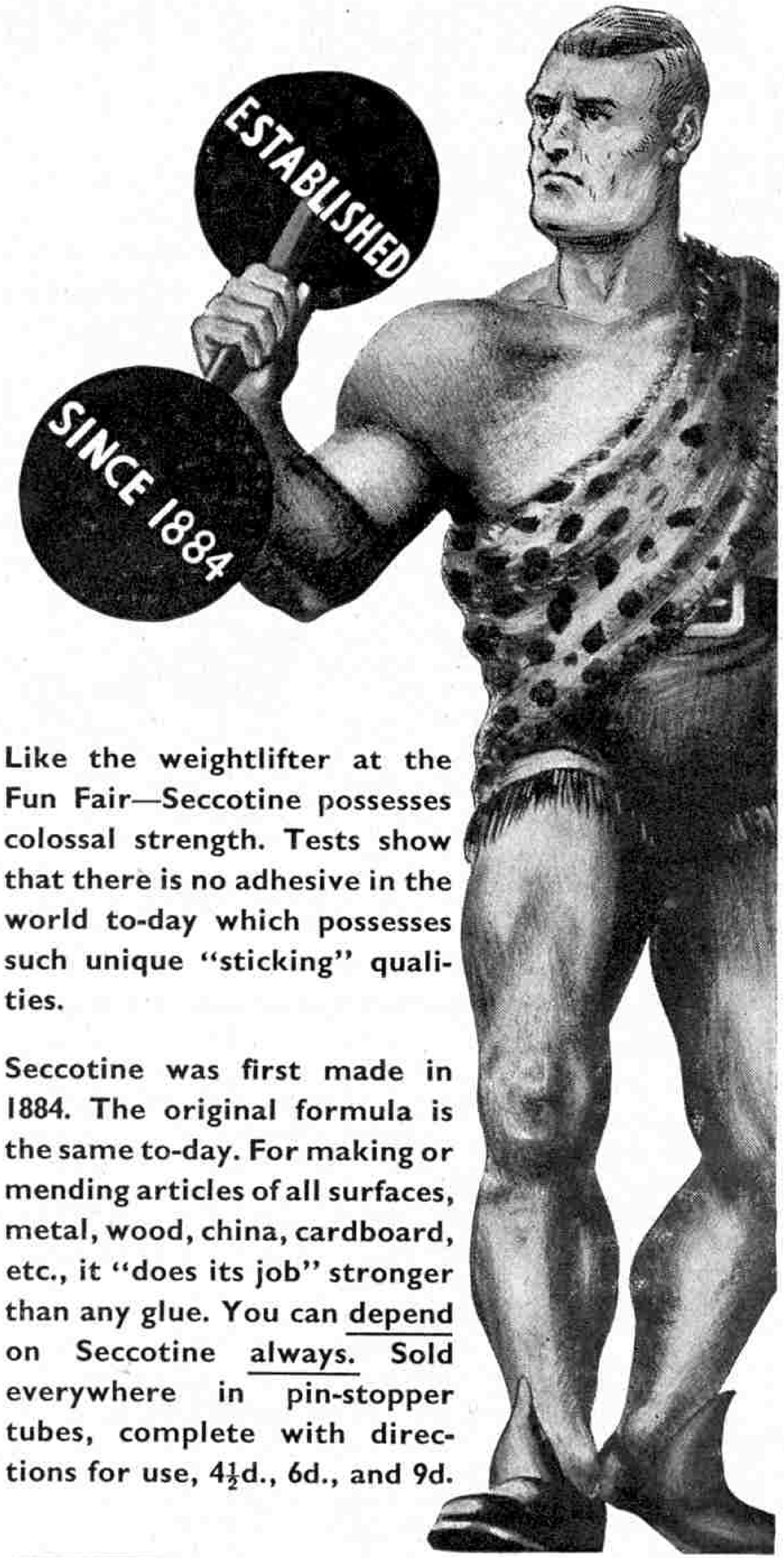
E. J. RILEY LIMITED, DEAL WORKS, ACCRINGTON
or Dept. 3, 147, Aldersgate Street, London, E.C.1



Like the weightlifter at the Fun Fair—Seccotine possesses colossal strength. Tests show that there is no adhesive in the world to-day which possesses such unique "sticking" qualities.

Seccotine was first made in 1884. The original formula is the same to-day. For making or mending articles of all surfaces, metal, wood, china, cardboard, etc., it "does its job" stronger than any glue. You can depend on Seccotine always. Sold everywhere in pin-stopper tubes, complete with directions for use, 4½d., 6d., and 9d.

SECCOTINE REGD.

The Double Strength ADHESIVE

POST THIS COUPON to Dept. M
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I should like to have, post free, copies of your Free Booklets which describe the many uses for Seccotine.

Name ....

Address ....

★You will be surprised to learn how cheap *real* Laboratory Apparatus is when you buy—

LOTT'S CHEMISTRY

SPARES

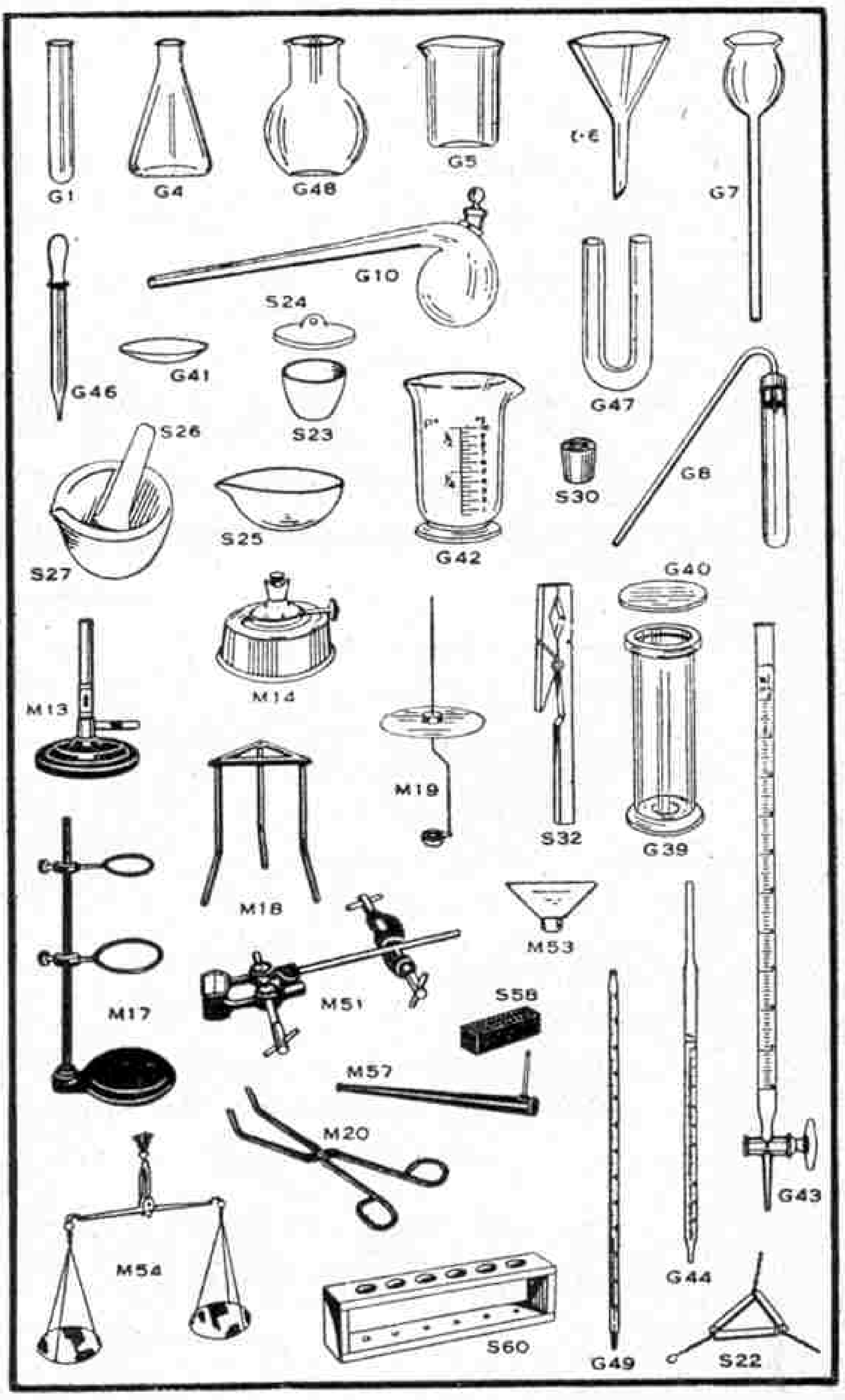
Just think what fun you could have with the extra apparatus illustrated. Exactly what you have always been wanting – you'll be able to invent a great many new and interesting experiments and learn to be a real scientist.

●

THIS SPARES LIST IS FREE!

●

Write today for your copy to Dept. M.M., Lott's Bricks Ltd., Watford, Herts. 1d. stamp on a postcard or 1½d. stamp on a letter, please.



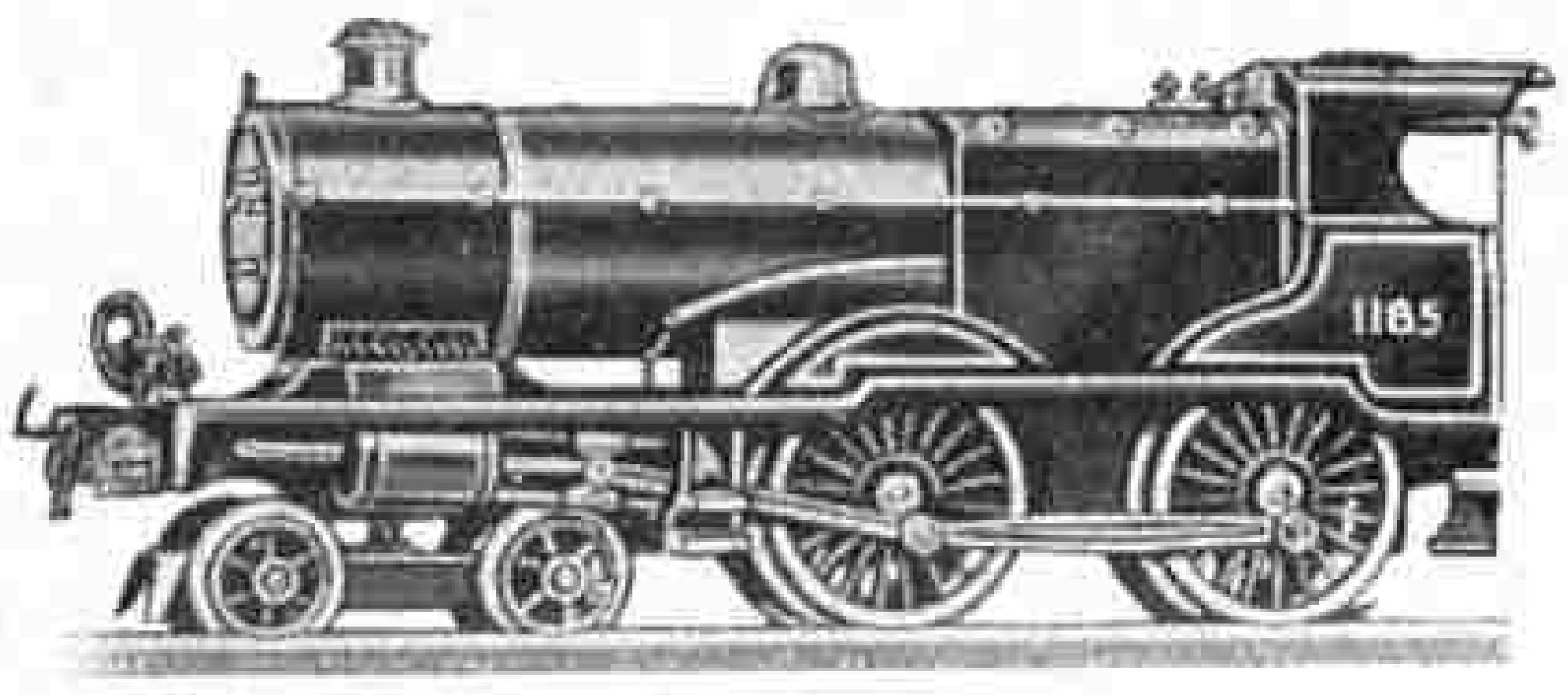
There is no make-believe, every piece is exactly as used by our present-day Scientists

Lott's Chemistry SETS are priced as follows:

Box 1 ... 3'6 Box 2 ... 5'- Box 3 ... 8'6
Box 4 ... 12'6 Box 5 ... 21'- Box 6 ... 27'6
and up to 105'-

LOTT'S BRICKS LTD., WATFORD HERTS.

PART-EXCHANGE SCHEMES FOR MECCANO PRODUCTS



Hornby Locomotives

No matter what the age or condition of your old Locomotive, you can exchange it under our "Part-Exchange" Scheme.

The allowance that will be made for your old Locomotive is shown in a list of Part-Exchange allowances for Hornby Locomotives that is obtainable from any Meccano or Hornby Train dealer, or direct from Meccano Ltd. Please note that the price of the new Hornby Locomotive you purchase **must not be less than double the Part-Exchange allowance** made for your old Locomotive.

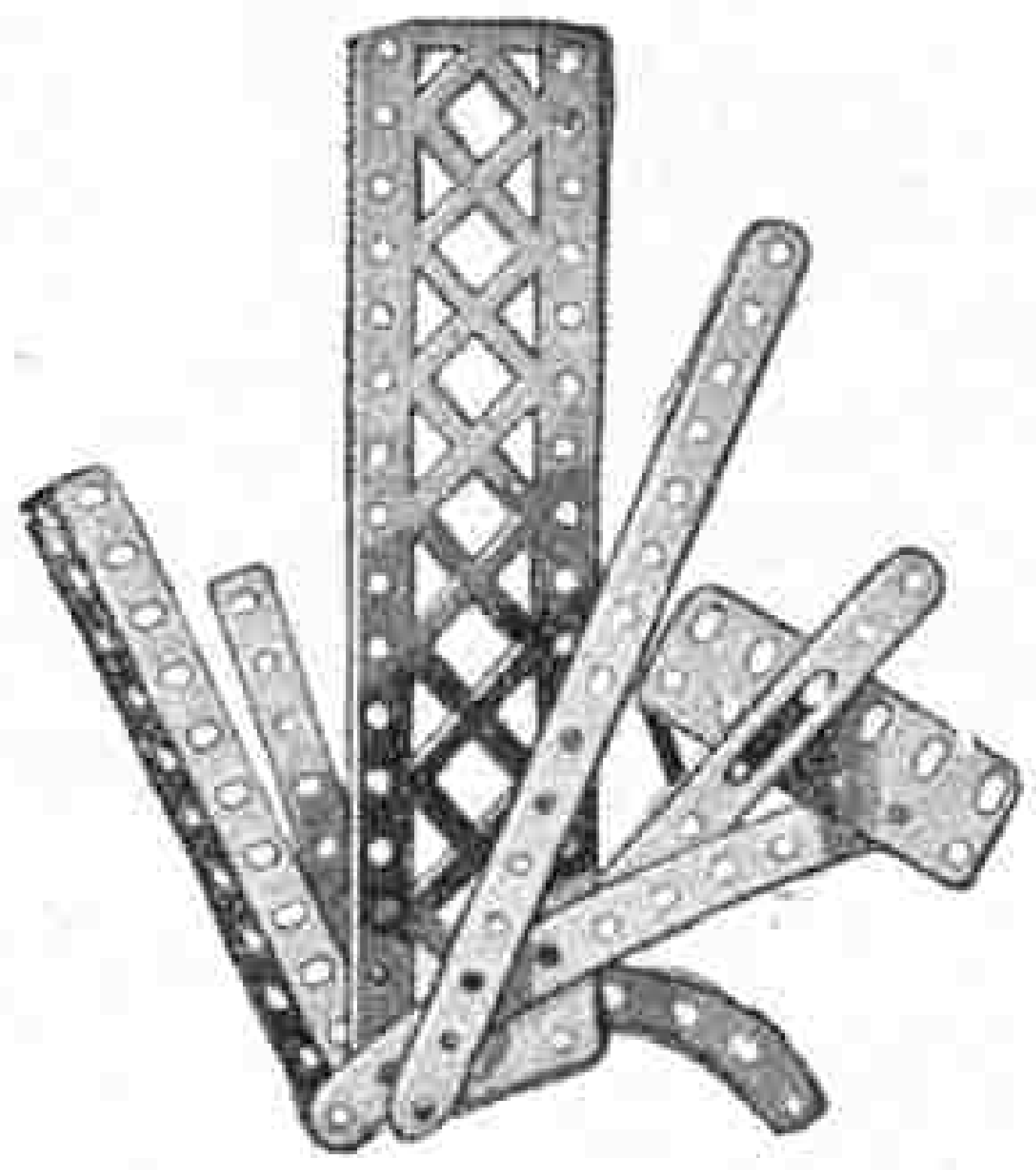
HOW THE SCHEME WORKS

Suppose you have a No. 1 Tank Locomotive that you wish to exchange. You see from the list that its exchange allowance is 5/9. You then look at the Hornby Train catalogue and choose one of the new Locomotives, the cost of which is not less than 11/6—that is, not less than double the Part-Exchange allowance we make for your No. 1 Tank Locomotive.

You decide to have, say, a No. 2 Special Tank Locomotive, the price of which is 21/–. Pack up your old No. 1 Tank, take it to your dealer, with 15/3, and he will exchange it for the new model that you require.

If it is more convenient you can send your old No. 1 Tank to us for exchange. In this case you deduct 5/9 from 21/– (the price of the new No. 2 Special Tank), and enclose 16/3, that is 15/3 plus 1/– for carriage on the new locomotive. Address your parcel to Meccano Limited, Special Service Department, Binns Road, Liverpool 13.

We cannot accept more than one old Locomotive in exchange for a new Locomotive. Tenders cannot be exchanged.

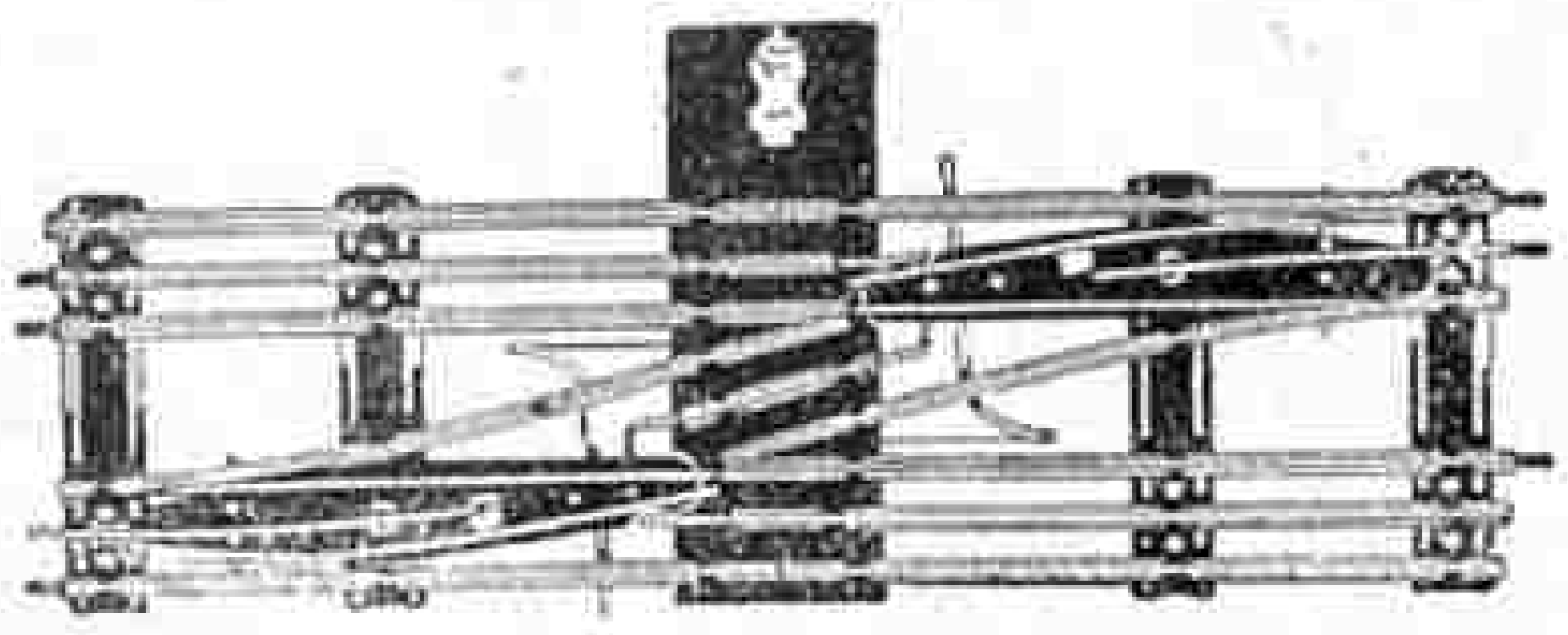


MECCANO PARTS

We undertake to exchange any damaged Meccano parts for similar new parts at half the current list price, no matter how old or how much damaged the parts.

Send them to Meccano Limited, Special Service Department, Binns Road, Liverpool 13, together with half the cost of the new parts, plus the return postage, which will be exactly the same as that you paid on the parcel of old parts.

Parts cannot be taken in exchange for Outfits.



HORNBY TRACK

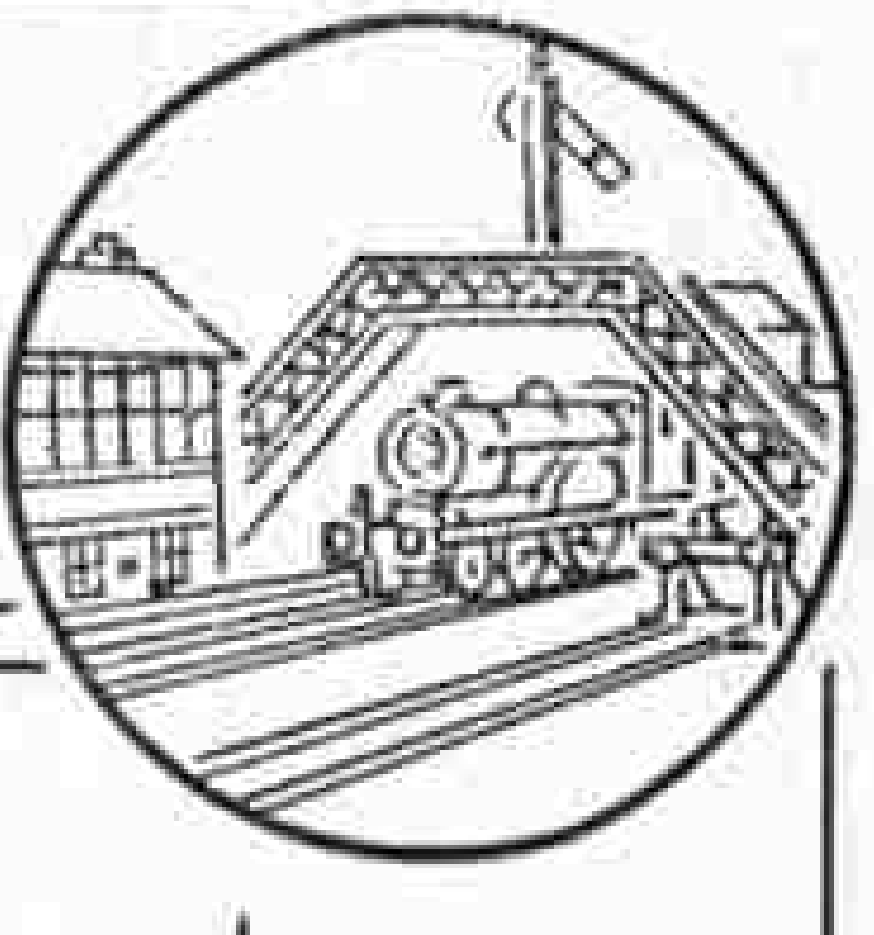
Hornby Clockwork Rails, Points and Crossings can be exchanged for Electric, on a piece-for-piece basis, the allowance being half the current list price of the Clockwork track returned.

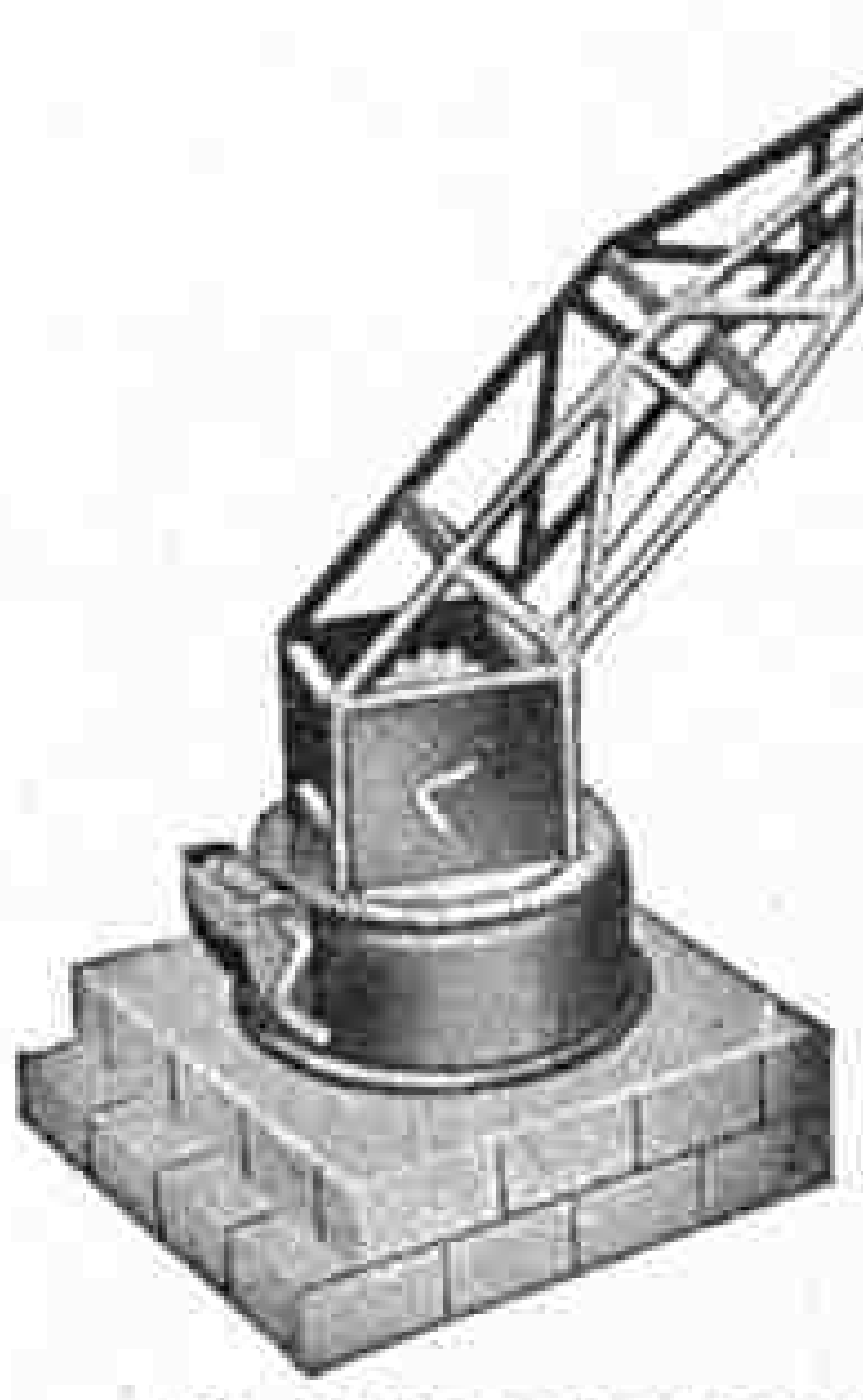
Send your Clockwork track to Meccano Limited, Special Service Department, Binns Road, Liverpool 13, together with the cost of the new track less half the price of the old track, plus the return postage, which will be exactly the same as that you paid on the parcel of old track.

This applies to Hornby Track only, not to Hornby Accessories fitted with rails.

The part-exchange scheme cannot be applied to any other Meccano products.

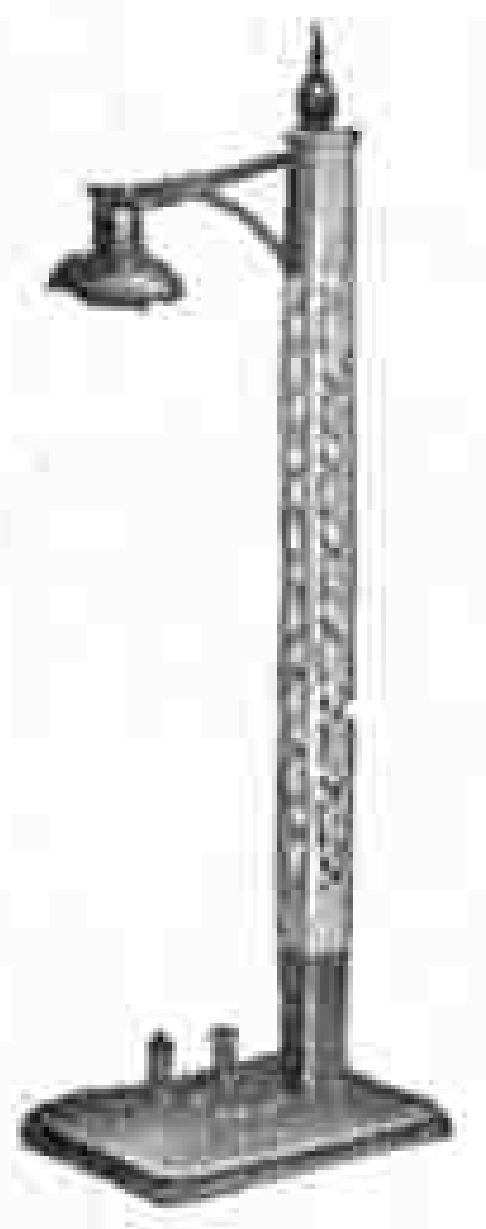
HORNBY ACCESSORIES





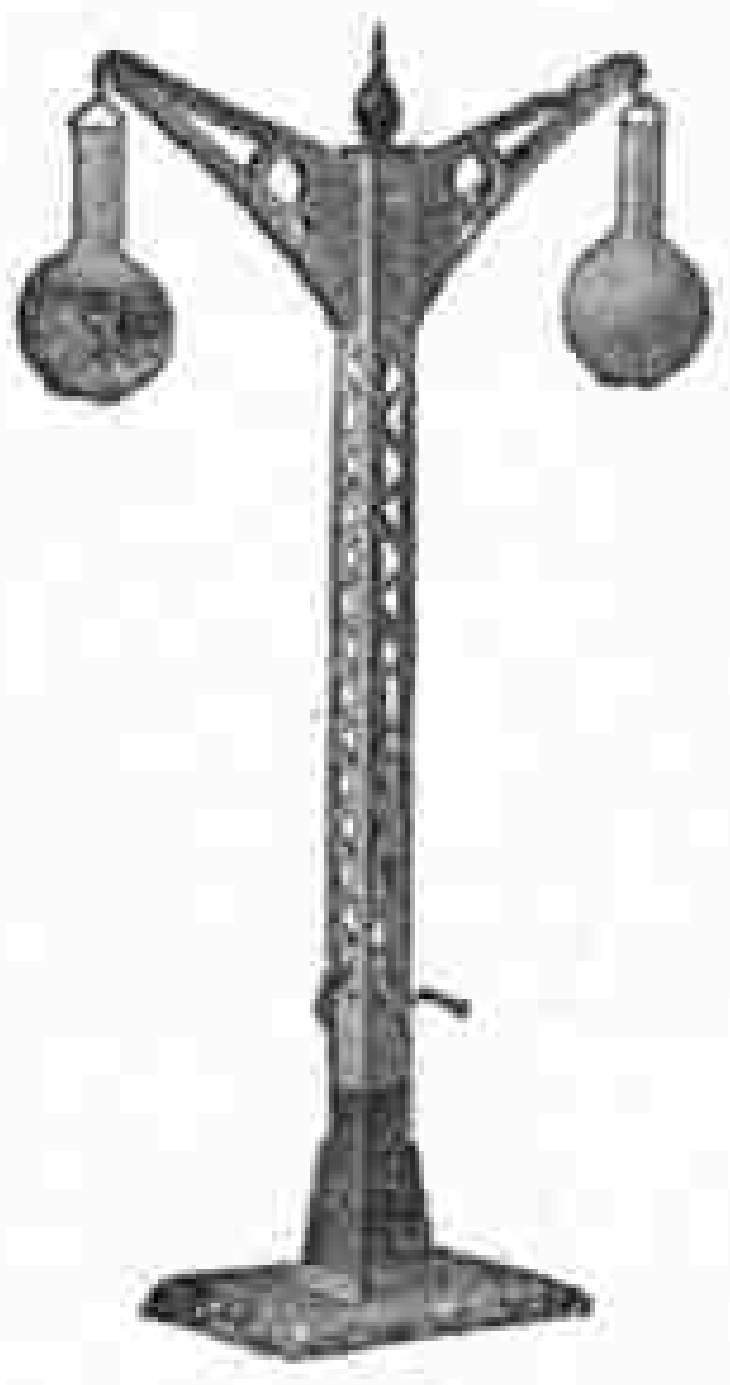
PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price 3/6

M STATION SET (7 pieces). Price **2/9** complete.
The components of the M Station Set may be purchased separately.
M Signal Box. Price **4d.** M Signal. Price **3d.** M Station. Price **1/–.**
M Telegraph Pole No. 1. Price **3d.** M Wayside Station. Price **8d.**



No. 1E LAMP STANDARD ELECTRICAL
(Single, as illustrated.)
Price 2/9

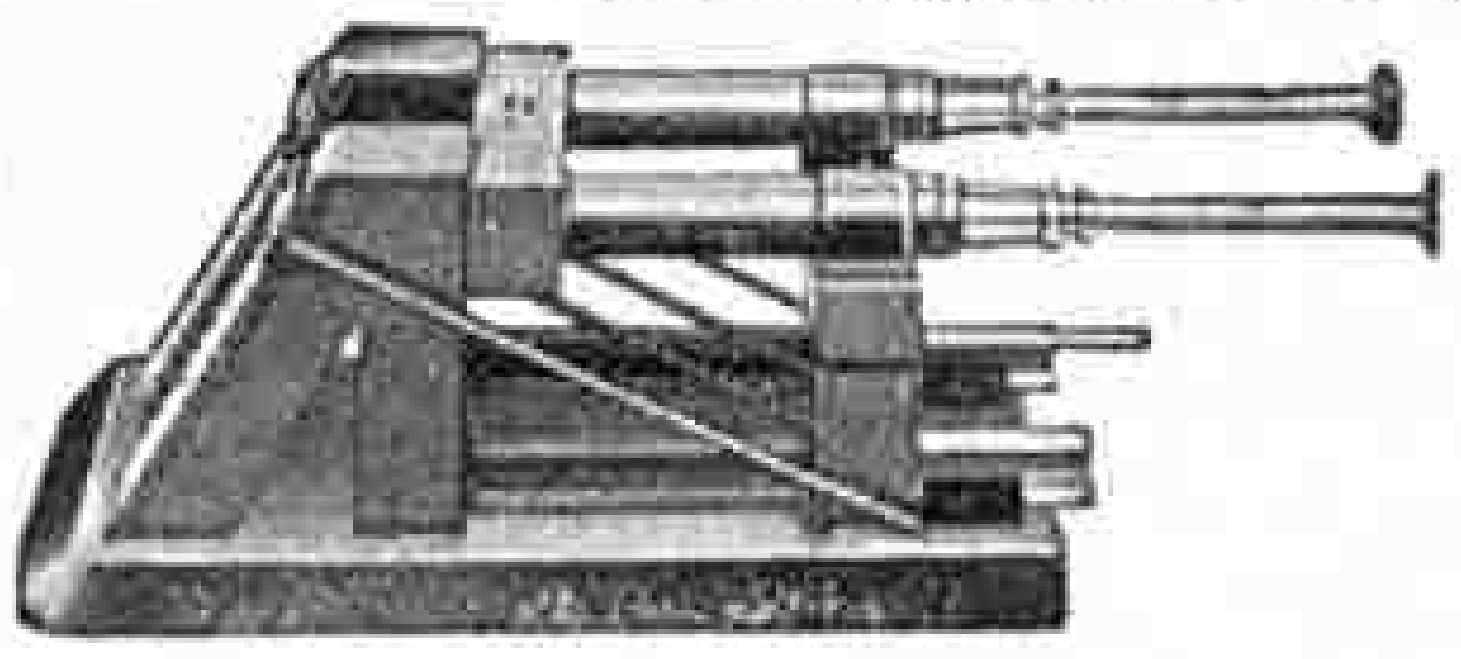
No. 2E LAMP STANDARD ELECTRICAL
(Double.)
Price 3/3



No. 1 LAMP STANDARD
(Single.)
Price 3/3

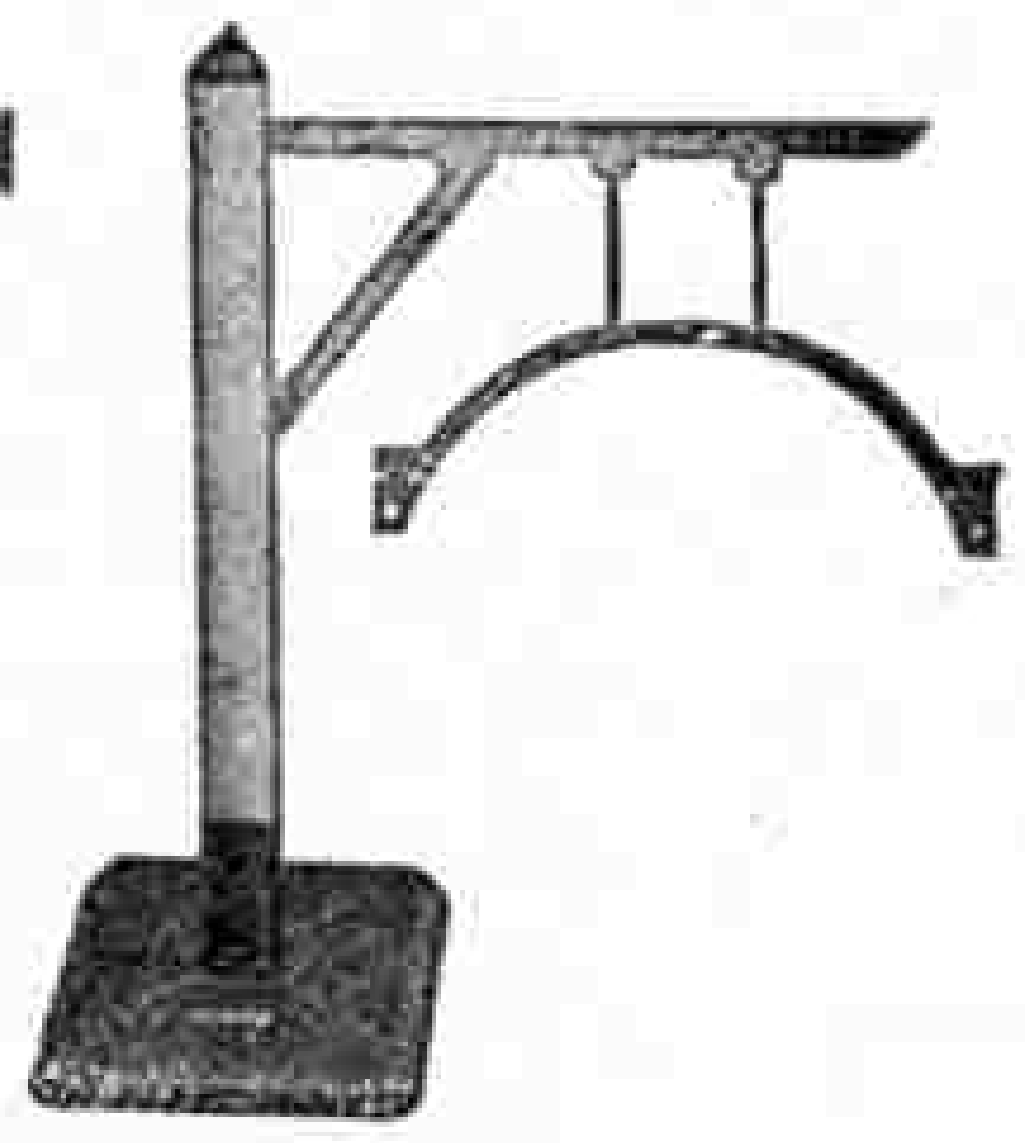
No. 2 LAMP STANDARD
(Double, as illustrated.)
Price 3/9

STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price 3d.



No. 2 BUFFER STOPS
(Hydraulic type.) Price 4/11

TUNNEL ENDS
Tunnels of varying lengths can be made with cardboard or other material, and then completed with the Tunnel Ends.
Price, per pair, 1/6



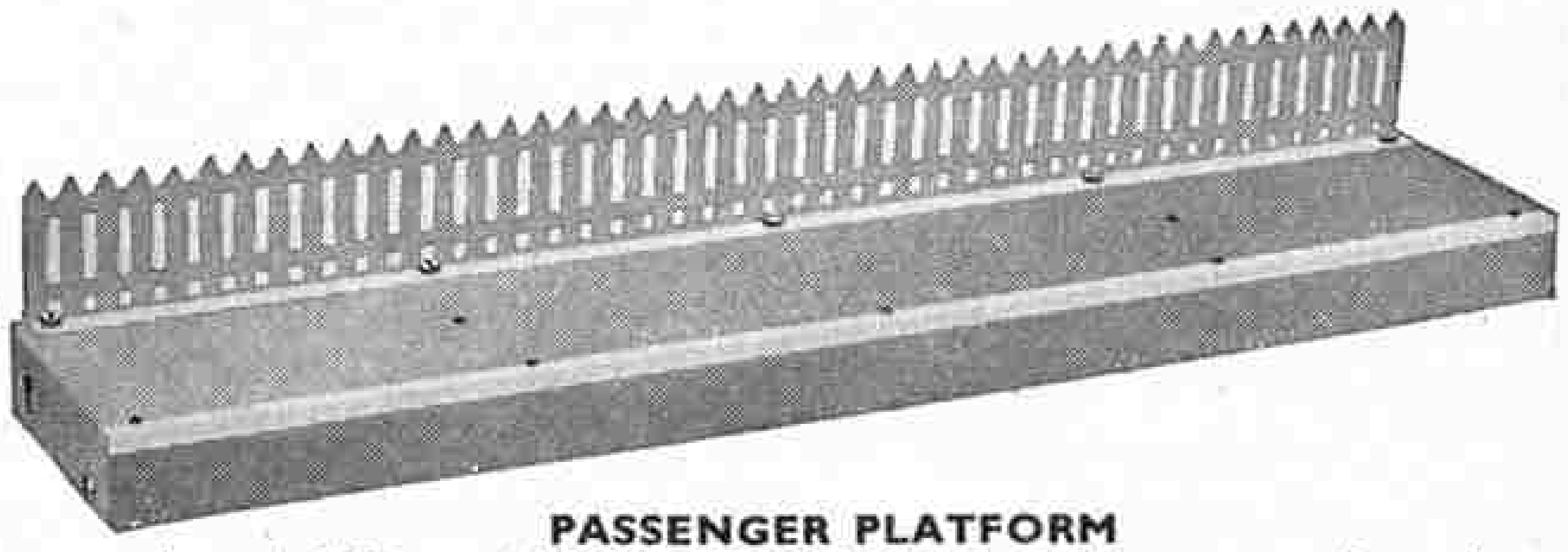
LOADING GAUGE
(Illustrated.)
Price 1/11

M LOADING GAUGE
Price 10d.

MECCANO LUBRICATING OIL
Price, per bottle, 6d.

No. 1A FOOTBRIDGE
Complete with Signals. Price 4/6

No. 1 FOOTBRIDGE
Without Signals. Price 2/11



PASSENGER PLATFORM
Length 16¾ in., width 3 in. This Platform may be connected to the main Station or used separately. Price 2/–
The white Paled Fencing may be purchased separately. Price, per length, 6d.

No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier, Shovel and Poker. Price **10d.**

No. 1 BUFFER STOPS
(Spring type).
Price 1/–

No. 1E BUFFER STOPS
As No. 1, but wired for electric lighting.
Price 1/3

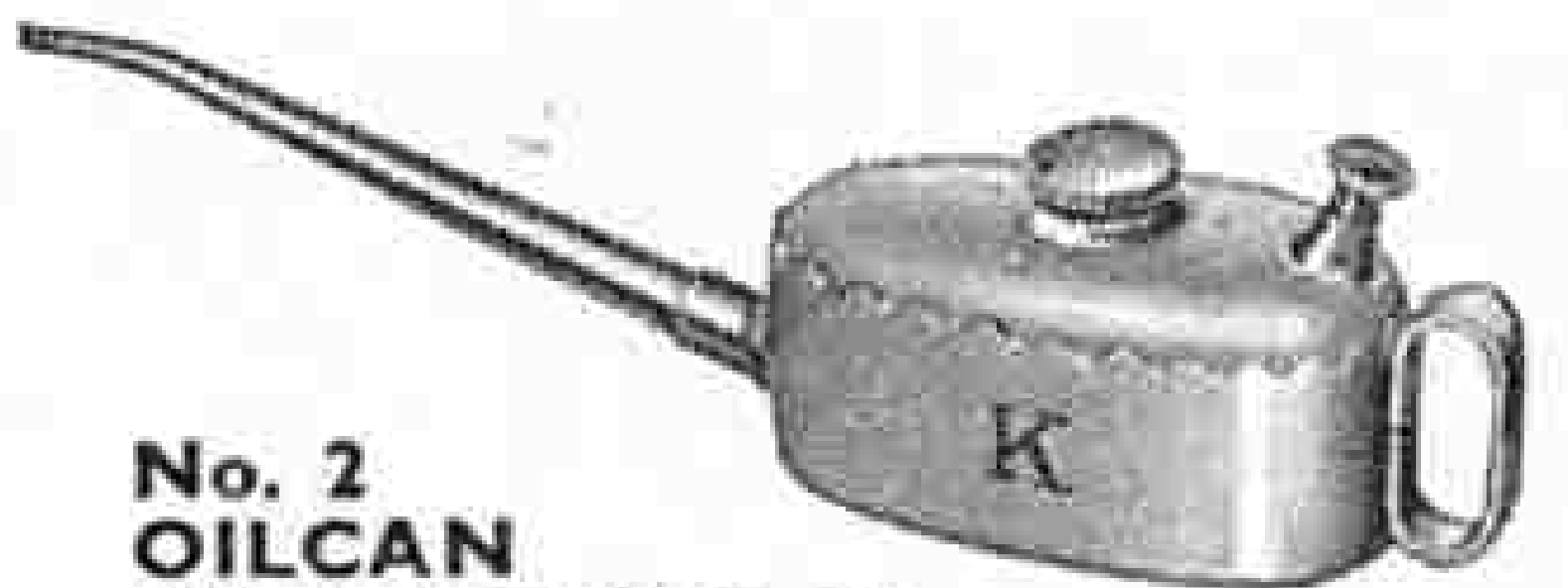
BRICKS FOR No. 2 HIGH CAPACITY WAGON
A realistic load for Hornby Wagons. They are packed in a box, the lid of which fits inside the No. 2 High Capacity L.N.E.R. Brick Wagon to form a base for the load. Price, per box, **10d.**

COAL FOR HORNBY WAGONS
Imitation coal for loading into Hornby Wagons. It is packed in a box the lid of which fits inside the L.M.S.R. and G.W.R. No. 2 High Capacity Wagons to provide a base for the load. Price, per box, **6d.**

POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price **6d.**
„ 2 Series. Packet of 51 „ **6d.**

POSTER BOARDS
Designed to carry Hornby Posters. Provided with lugs for attachment to Paled Fencing, etc. Packet of 6 (3 large and 3 small). Price **4d.**

DIE-CAST SPOKED WHEELS
As fitted to Hornby Wagons, etc.
Price, per pair, 3d.

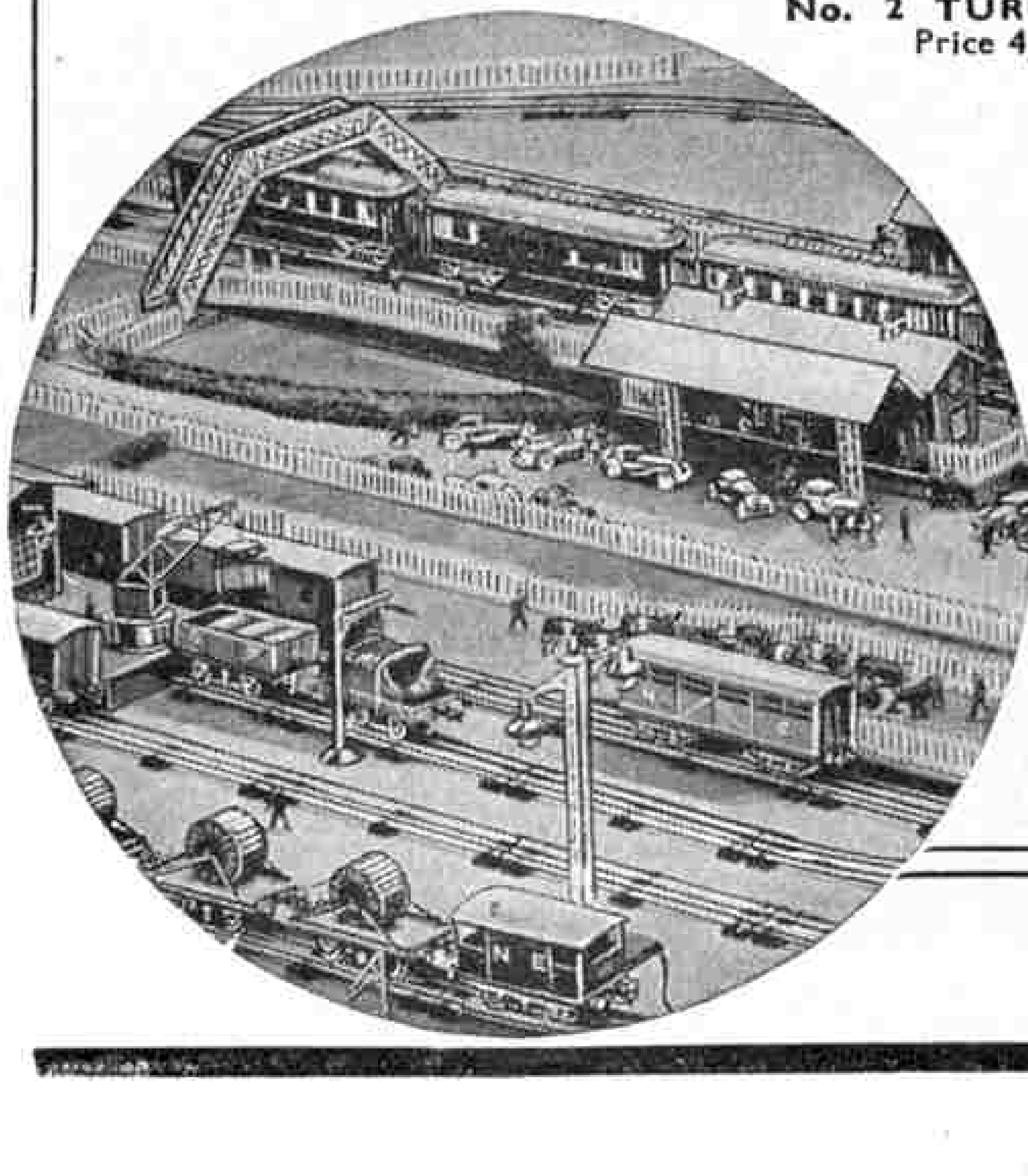


No. 2 OILCAN
("K" Type.) The oil is ejected drop by drop by depressing the valve. Polished copper. Price 3/6

No. 2 TURNTABLE
Price 4/–

No. 1 OILCAN
Price 6d.

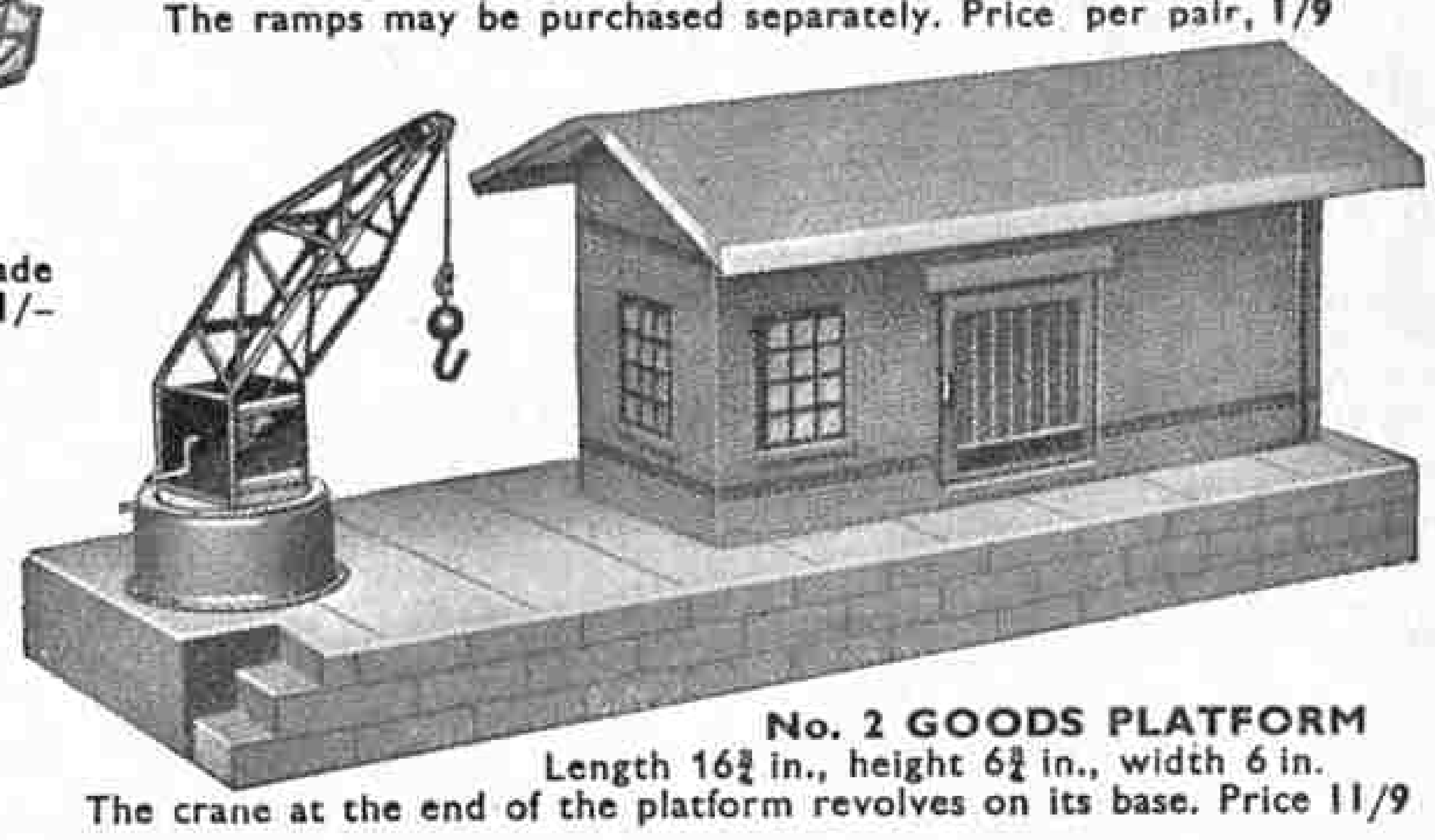
ISLAND PLATFORM
Length 32½ in., height 6¾ in., width 3 in. Price 6/3
The ramps may be purchased separately. Price per pair, 1/9



M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price 1/–

No. 8 RAILWAY ACCESSORIES

Notice Boards. Price 2/–

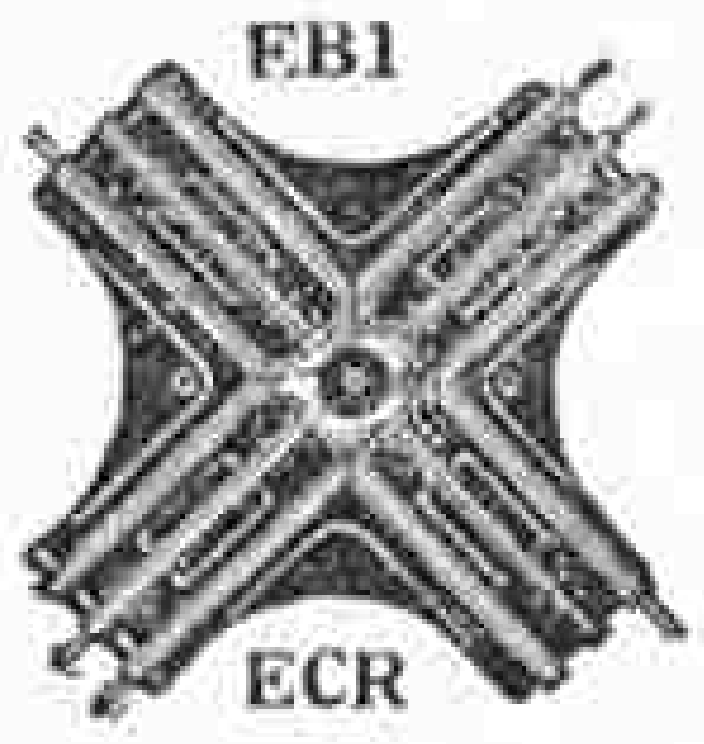


No. 2 GOODS PLATFORM
Length 16¾ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price 11/9

MECCANO LTD., LIVERPOOL 13

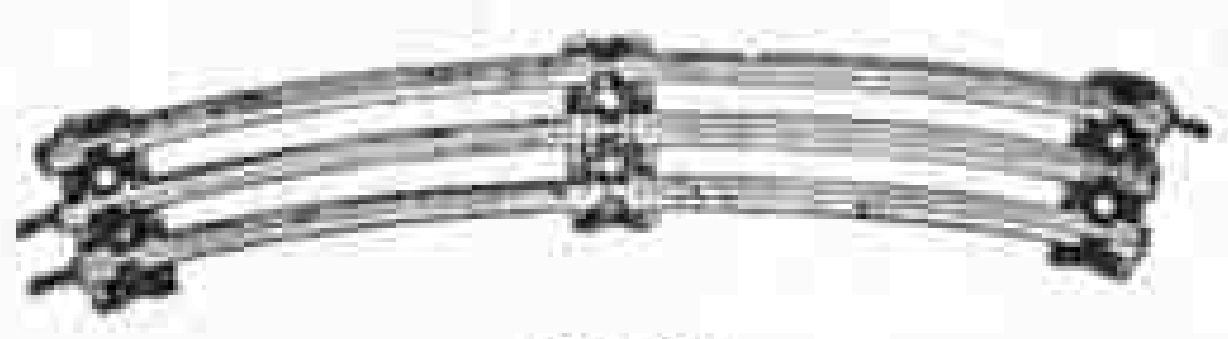
HORNBY RAILS, POINTS and CROSSINGS

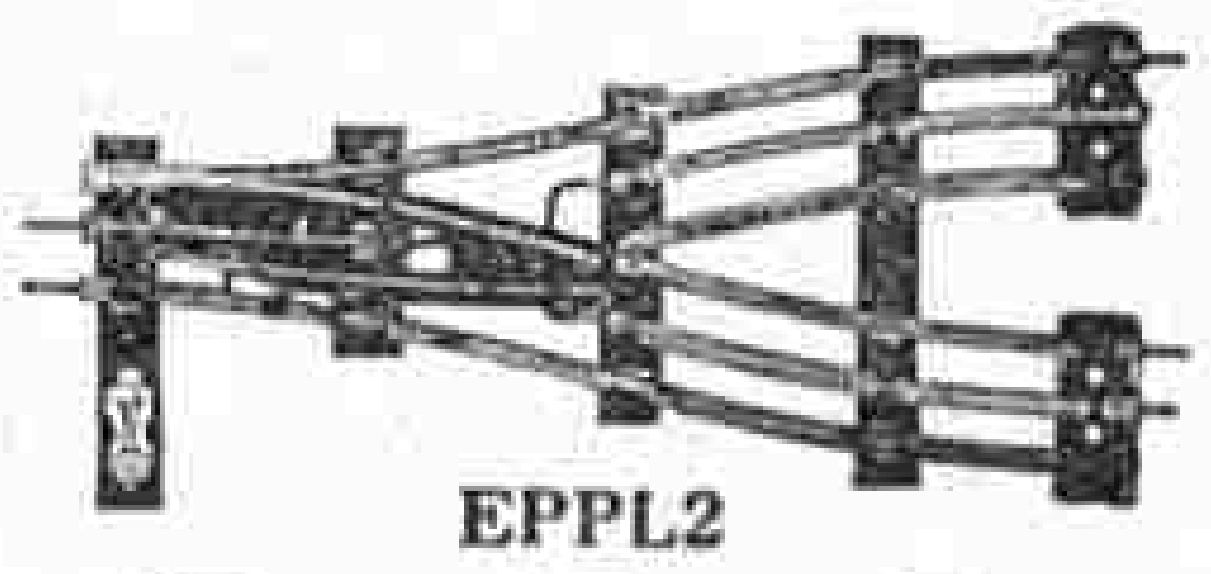
EB1

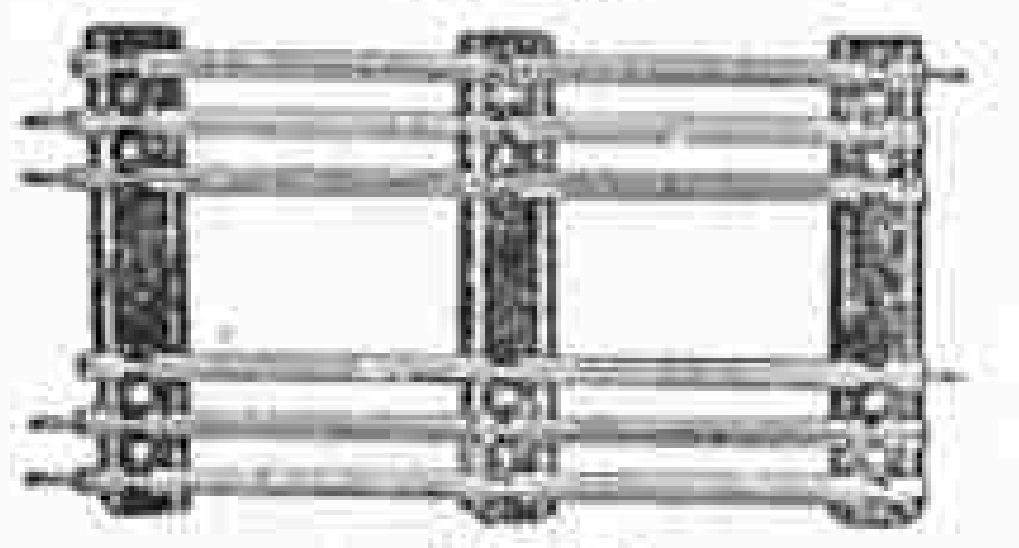

ECR

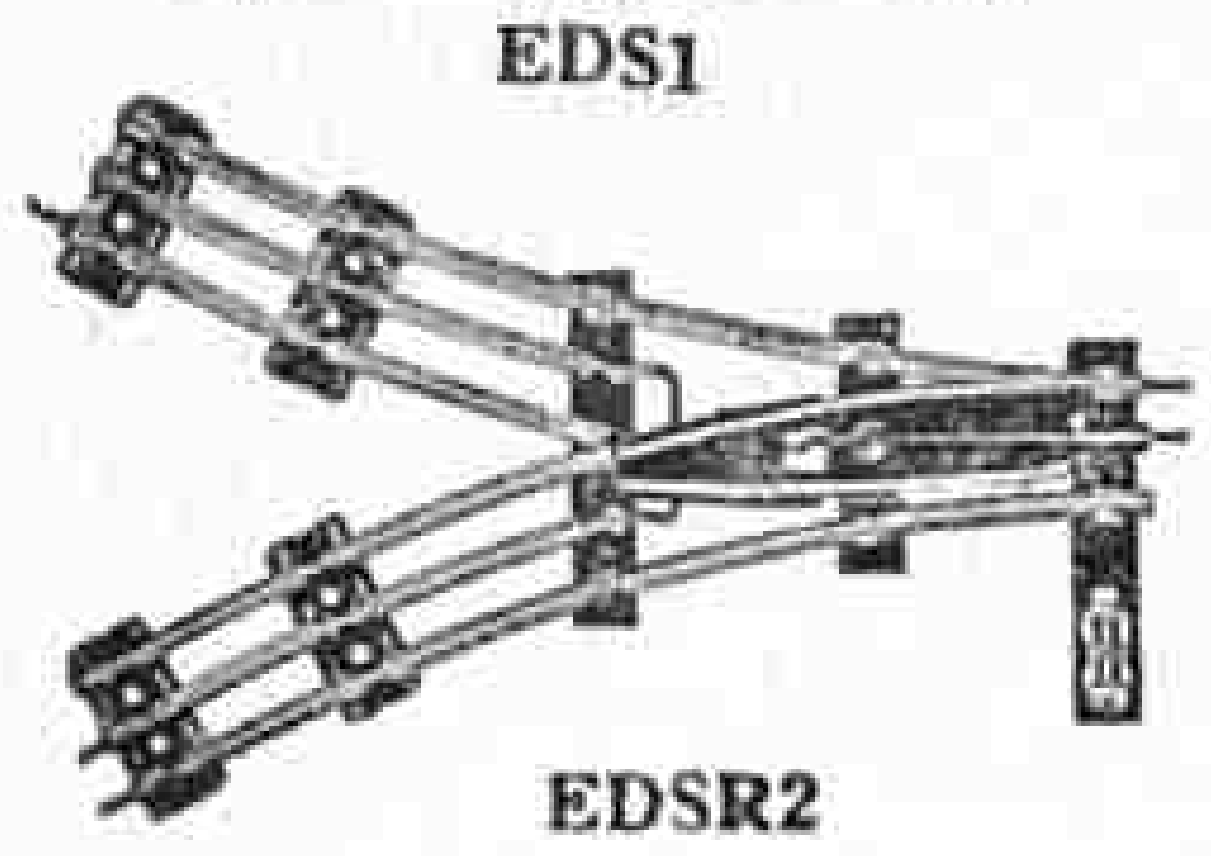
EA2½

EB½


EA2


EPPL2


EDS1


EDSR2

GAUGE 0, 1¼". **HORNBY SERIES.**

Hornby Rails, Points and Crossings are built for hard wear and for smooth running.

There is practically no limit to the number of rail formations that can be built with them. Their adaptability is well shown in the booklets "How to Plan your Hornby Railway" and "Hornby Layouts–100 Suggestions," both of which may be obtained from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d.

A SELECTION OF RAILS, POINTS AND CROSSINGS

FOR ELECTRIC TRAINS

EB1 Straight rails	per doz. 6/–
EB½ „ half rails ...	„ „ 5/–
EA2¼ Curved quarter rails (2 ft. radius)	„ „ 4/6
EA2 Curved rails (2 ft. radius)	„ „ 6/–
EPPR2 Parallel points, right-hand	per pair 7/–
EPPL2 Parallel points, left-hand	
These points can be used with either 1ft. or 2ft. radius track.	
EPR2 Right-hand points (2 ft. radius)	per pair 8/–
EPL2 Left-hand points (2 ft. radius)	
EPR1 Right-hand points (1 ft. radius)	per pair 6/6
EPL1 Left-hand points (1 ft. radius)	

EDS1 Straight rails, double track	½ doz. 8/6
EDSR2 Double symmetrical points, right-hand (2 ft. radius)	per pair 7/–
EDSL2 Double symmetrical points, left-hand (2 ft. radius)	
EDSR1 Double symmetrical points, right-hand (1 ft. radius)	per pair 7/–
EDSL1 Double symmetrical points, left-hand (1 ft. radius)	

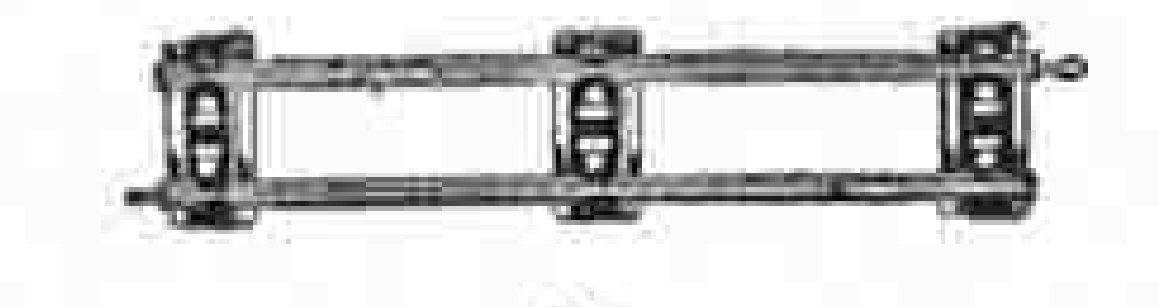
FOR CLOCKWORK TRAINS

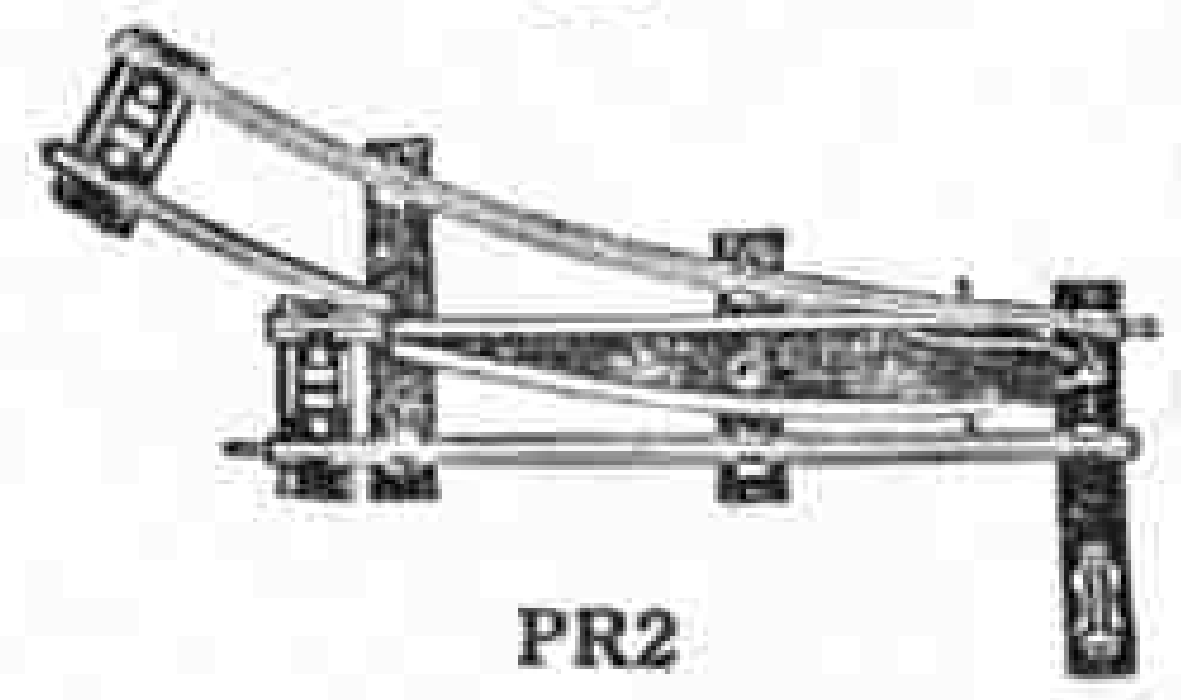
B1 Straight rails	per doz. 4/–
A1 Curved rails (1 ft. radius)	„ „ 4/–
PR1 Right-hand points (1 ft. radius)	per pair 3/6
PL1 Left-hand points (1 ft. radius)	
PR2 Right-hand points (2 ft. radius)	per pair 3/6
PL2 Left-hand points (2 ft. radius)	

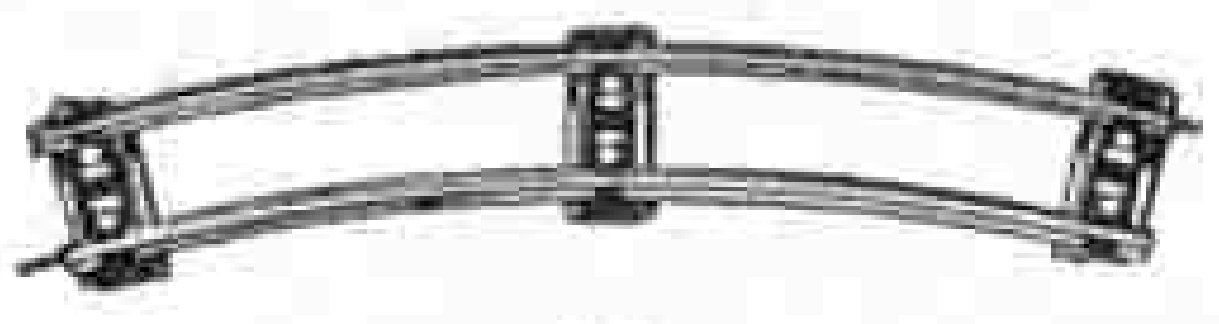
CA2 Acute-angle crossings (for 2 ft. radius track)	each 1/6
PPR2 Parallel points, right-hand	per pair 4/–
PPL2 Parallel points, left-hand	
These points can be used for either 1 ft. or 2 ft. radius track.	
DC2 Curved rails, double track, 2 ft. radius only ...	½ doz. 6/–

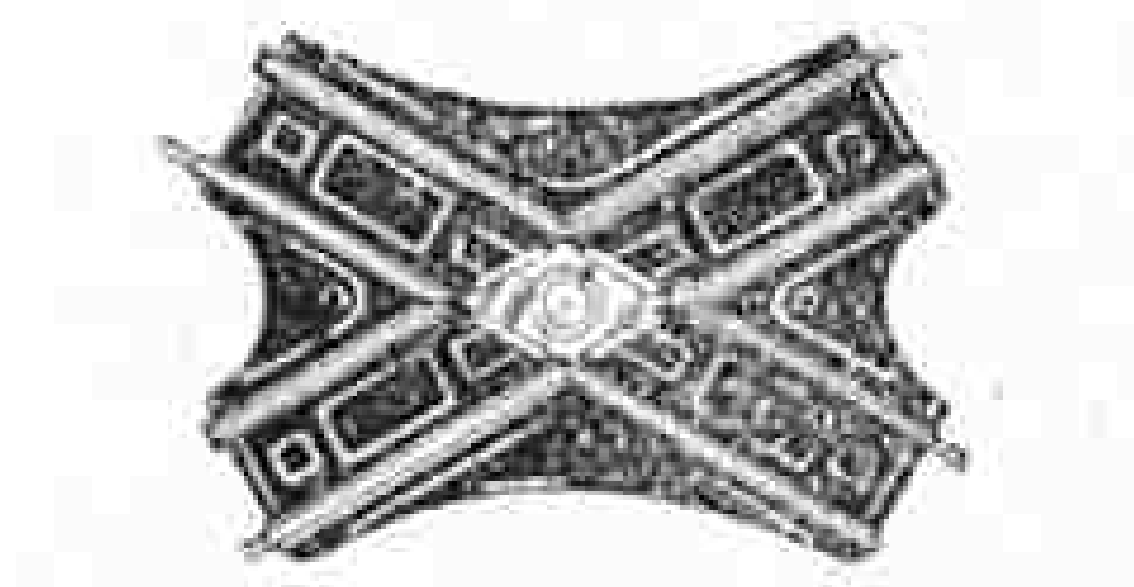
Ask your dealer for an illustrated price list.

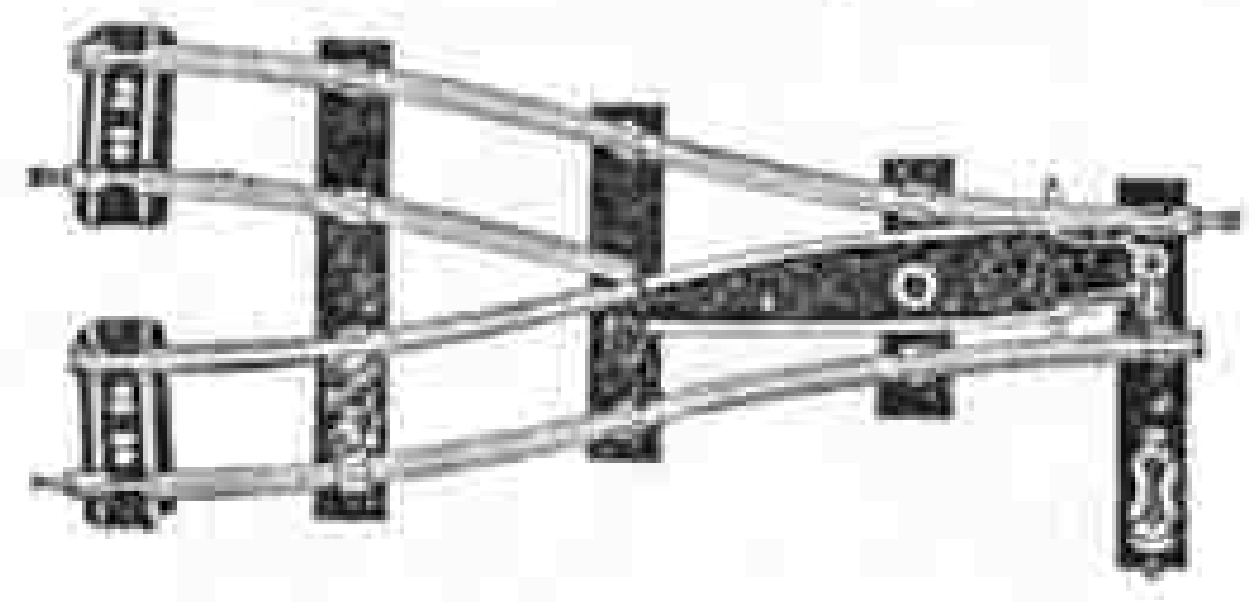
MECCANO LIMITED, Binns Road, Liverpool 13

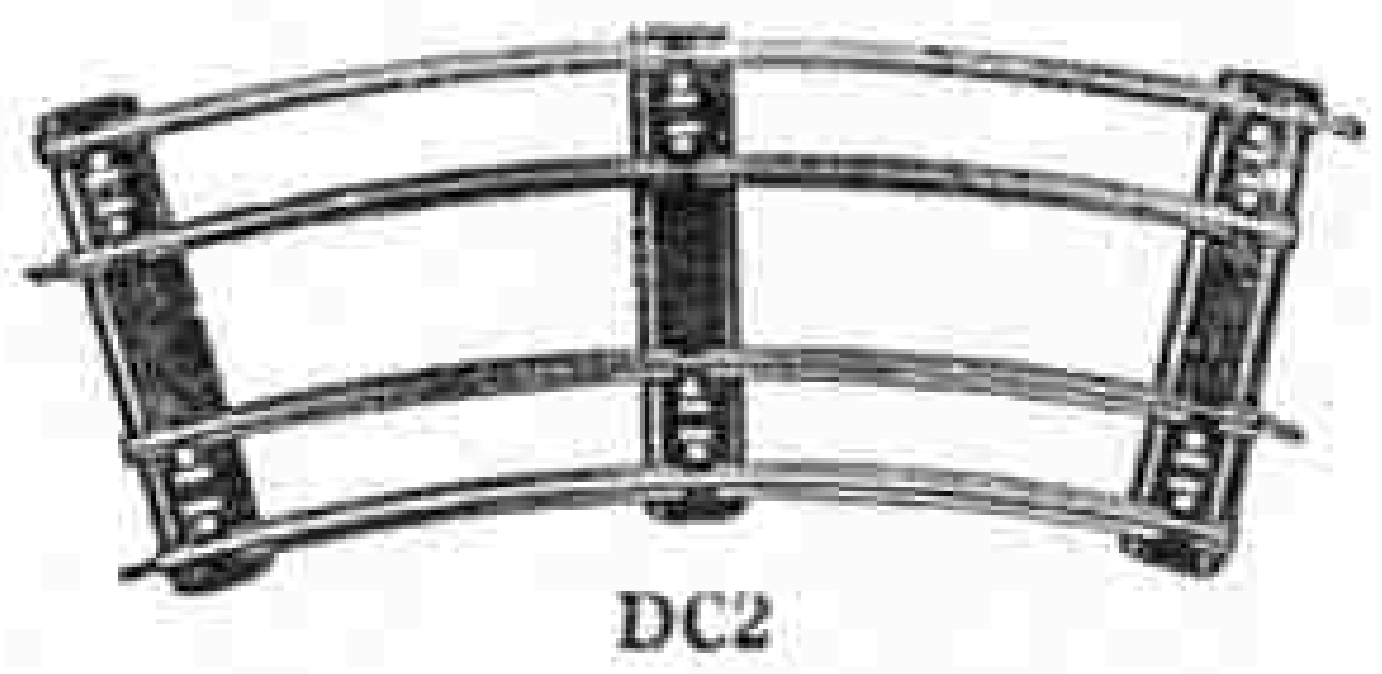

B1


PR2


A2


CA2


PPR2


DC2

A fascinating building hobby

FOR BOYS AND GIRLS

Dinky Builder Outfits are great favourites with boys and girls. Simplicity is the keynote of this building system, by means of which even the youngest children can construct an unlimited variety of models.

No. O DINKY BUILDER OUTFIT

The first Outfit in the Series, from which 40 models as shown in the Instructions Folder, and many others, can be built. Price **2/6**

No. I DINKY BUILDER OUTFIT

Contains a larger and more varied selection of parts with which 56 models can be built, as shown in the Instructions Manual. Price **4/11**

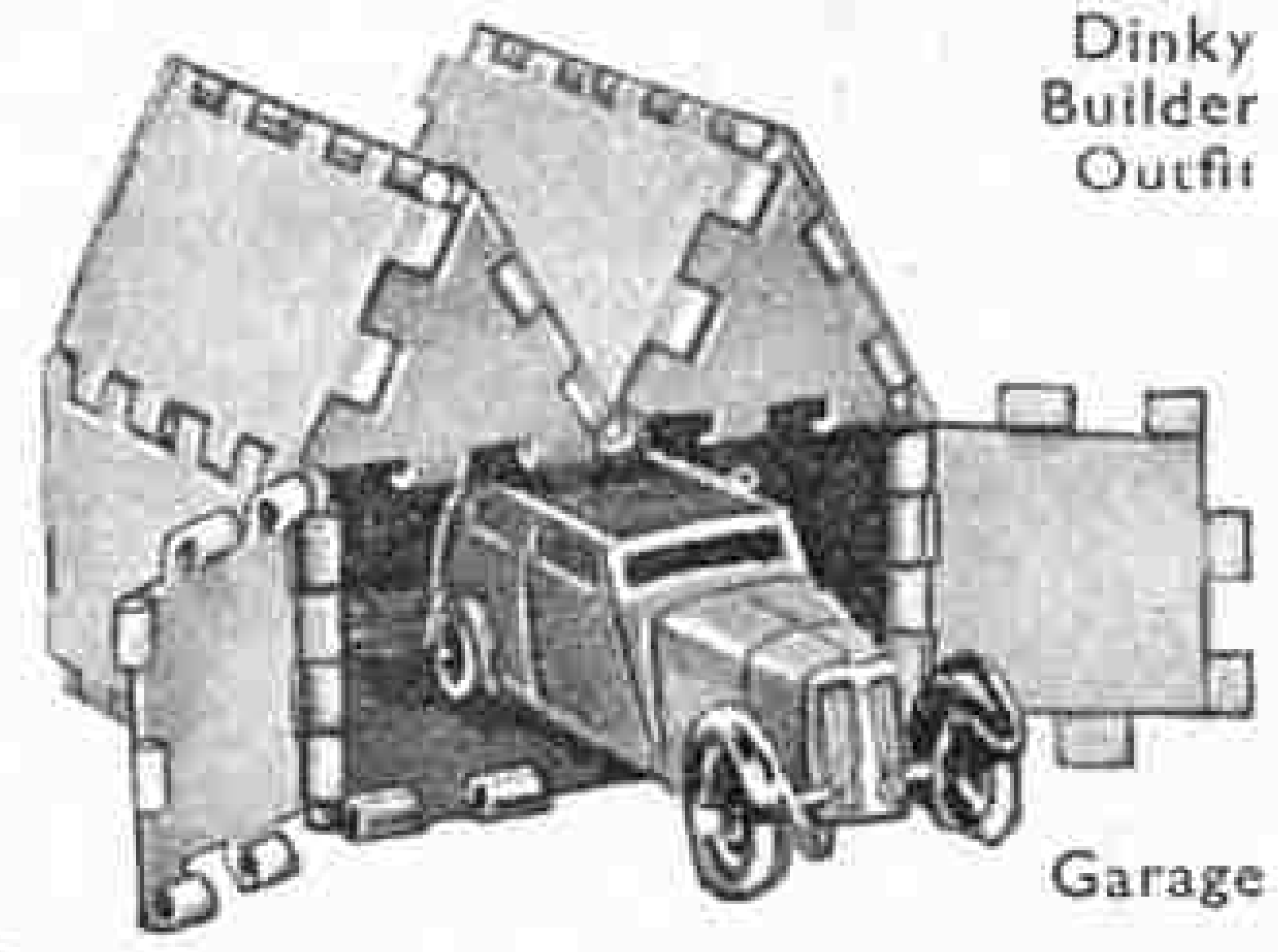
No. 2 DINKY BUILDER OUTFIT

With the parts in this Outfit all the No. O and No. 1 models can be built, together with groups of model furniture, as illustrated in the Instructions Manual. Price **7/9**

DINKY BUILDER "A"

The Dinky Builder "A" packet contains a useful assortment of Dinky Builder Parts with which Outfits No. O, No. 1, No. 2 and No. 3 may be supplemented. Price **1/–**

No. 2 Dinky Builder Outfit


Garage

No. 3 DINKY BUILDER OUTFIT

This is the largest and best Outfit in the Series. The models that can be built with it are almost endless in number, and the Manual of Instructions illustrates **92 splendid examples. Price 10/9**

DINKY BUILDER

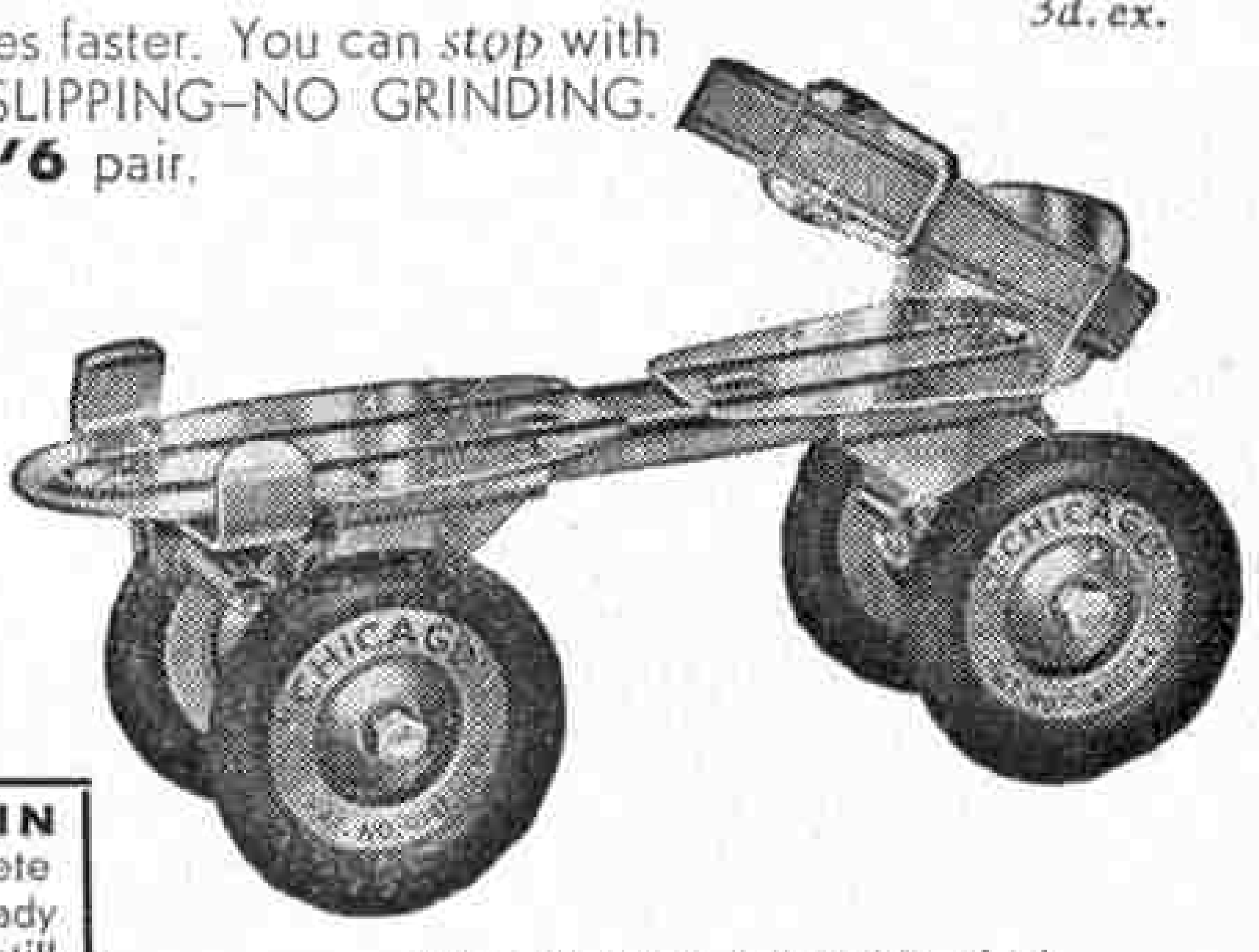
Manufactured by Meccano Limited, Binns Road, Liverpool 13

TWO POPULAR LINES FROM THE WIDE RANGE AT **RAVEN'S STORES** POST FREE

Carriage paid in U.K. on all orders over 5′- Under 5′- 3d. ex.

★ **"SILENT FLASH" RUBBER TYRED ROLLER SKATES.** These grand, noiseless, high-speed skates have solid rubber tyres that will out-wear **2** sets of ordinary steel wheels and will actually spin **4** times faster. You can *stop* with *4-wheel brakes* and there is NO GRATING–NO SLIPPING–NO GRINDING. Suitable for all ages between 7 and 77 years. **24′6** pair.

★ **YOUNG WIRELESS OPERATOR.** Here is an excellent outfit, 2 Buzzer sets with morse code printed on each. Tapping keys are provided on both instruments, the words tapped out on one being audibly recorded on the other so that messages may be sent from one room to another. The specially manufactured Buzzers possess, among other advantages, silver contacts. Price **5′6** including battery. Post free.



THE COMMAND CAR. We have sold hundreds of this amazing toy, it obeys the voice, you say **GO** and it goes! say **STOP** and it stops. **3′9** post free, 2 for **7′-.**

RAVEN'S TWIN TRAIN. A complete stock of this is kept ready for despatch. It is still the greatest little train on earth.

ALSO STOCKED (all Ball-Bearing)

Universal, Nickel-Plated, special value	**5′9** pr.
Universal, Streamlined, with girder frame	**9′6** pr.
Boys, Nickel-Plated, heavy duty ...	**11′6** pr.
Girls, Nickel-Plated, heavy duty ...	**12′6** pr.

RAVEN'S, SOUTHEND-ON-SEA

MECCANO ENAMEL

Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, blue or green, each colour being identical in shade with the enamels used in the Meccano Factory for spraying Meccano parts. Price per tin 8d.

Meccano Ltd., Binns Road, Liverpool 13.

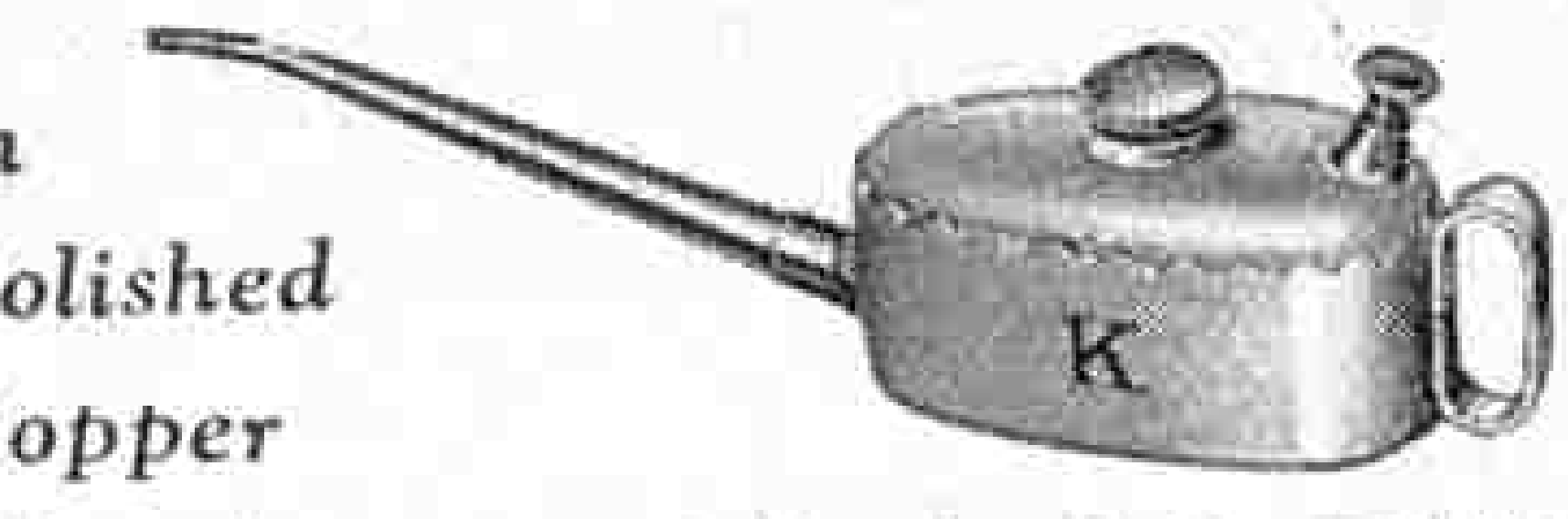
MECCANO LUBRICATING OIL

Before commencing to operate a Meccano model, or to run a Hornby Train, all gears and bearings should be oiled thoroughly with Meccano Lubricating Oil. This oil is specially prepared and is of the right consistency for the purpose. Price per bottle 6d.

Meccano Ltd., Binns Road, Liverpool 13.

OIL CAN No. 2 ("K" Type)

In Polished Copper



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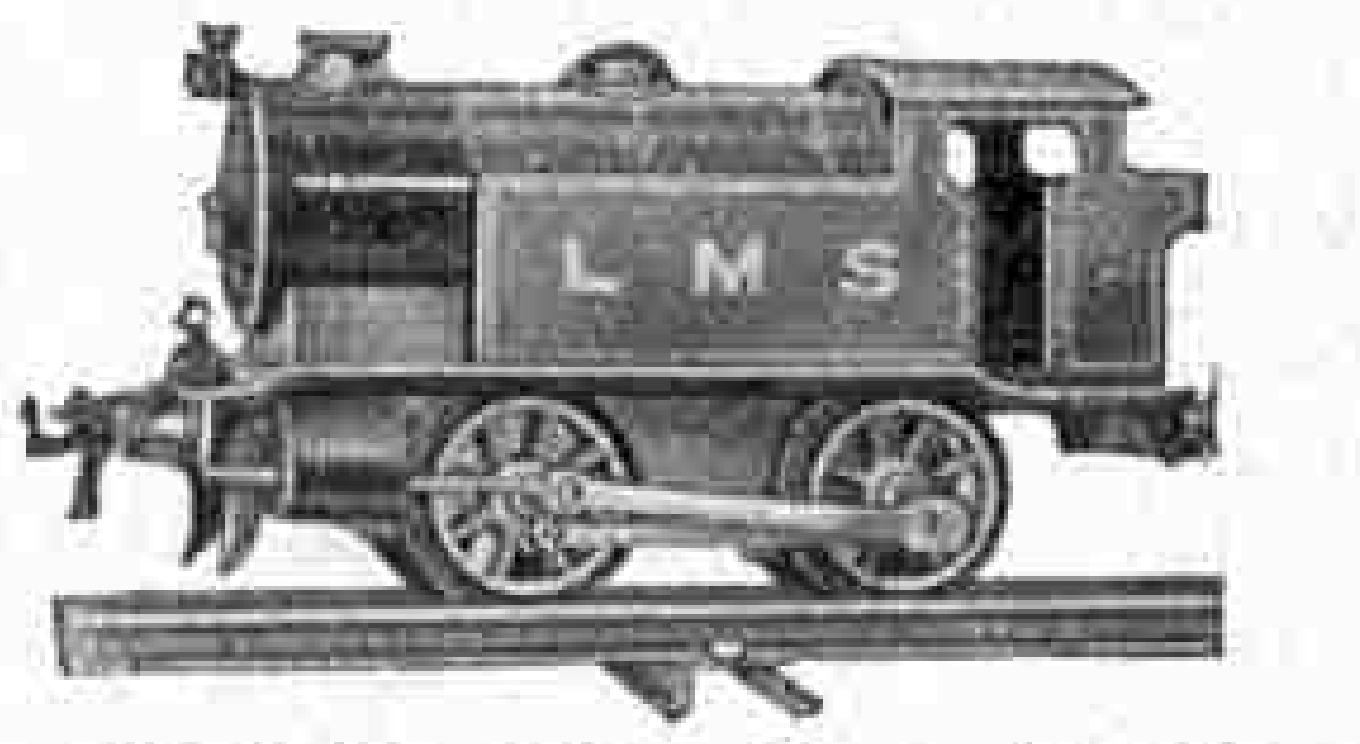

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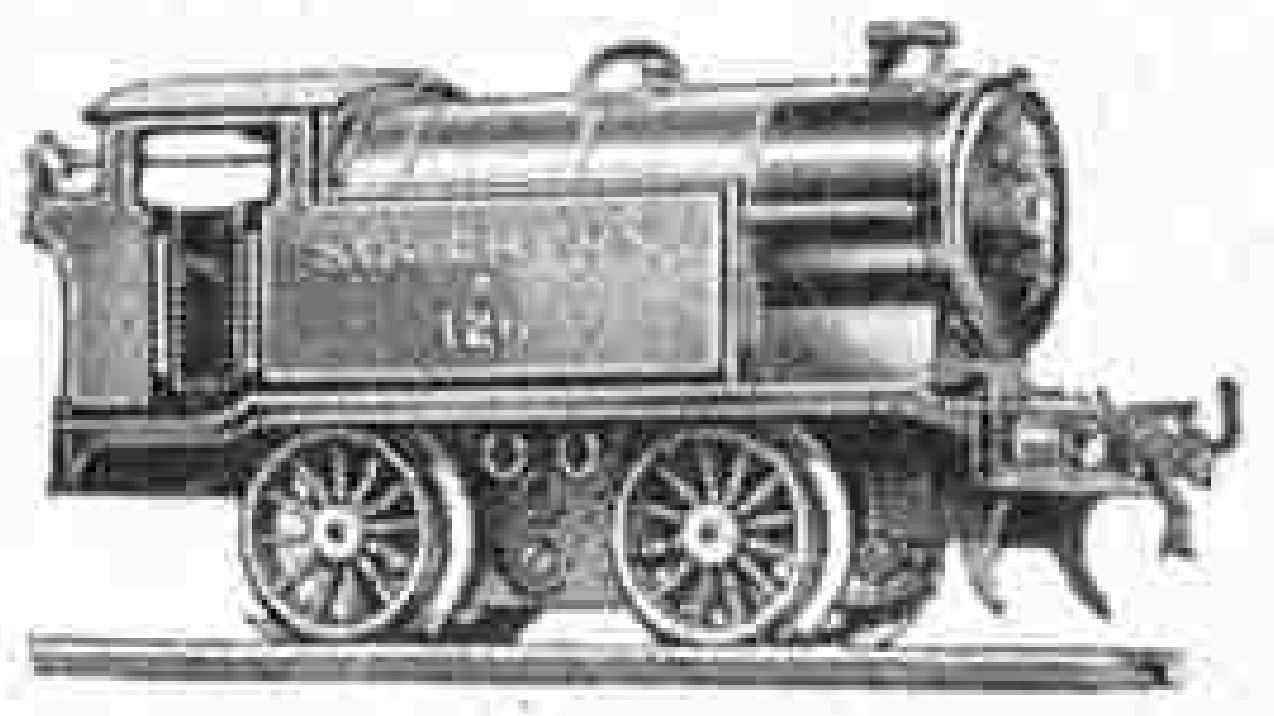

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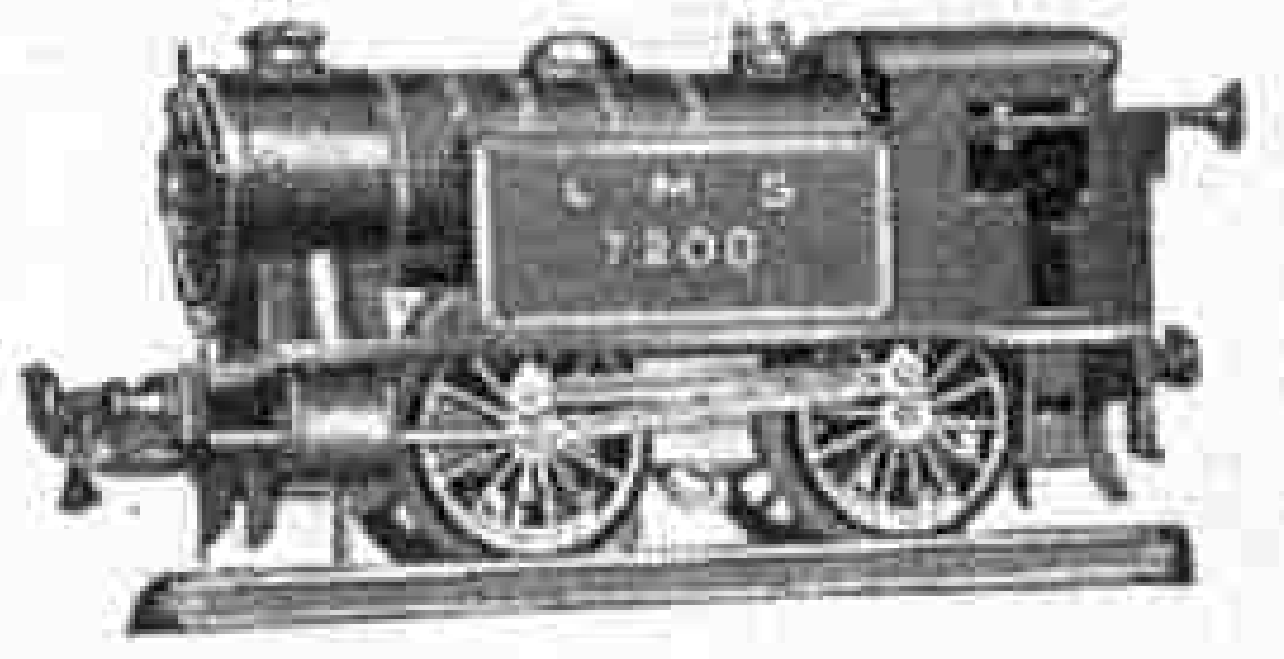

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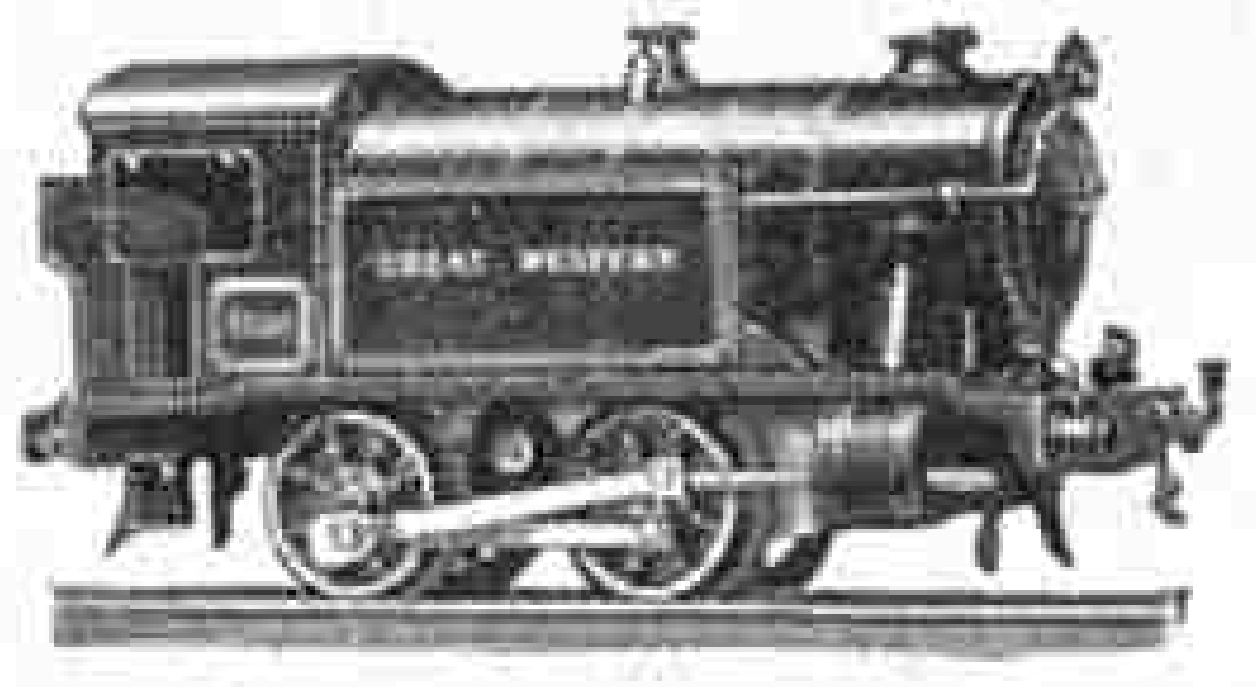

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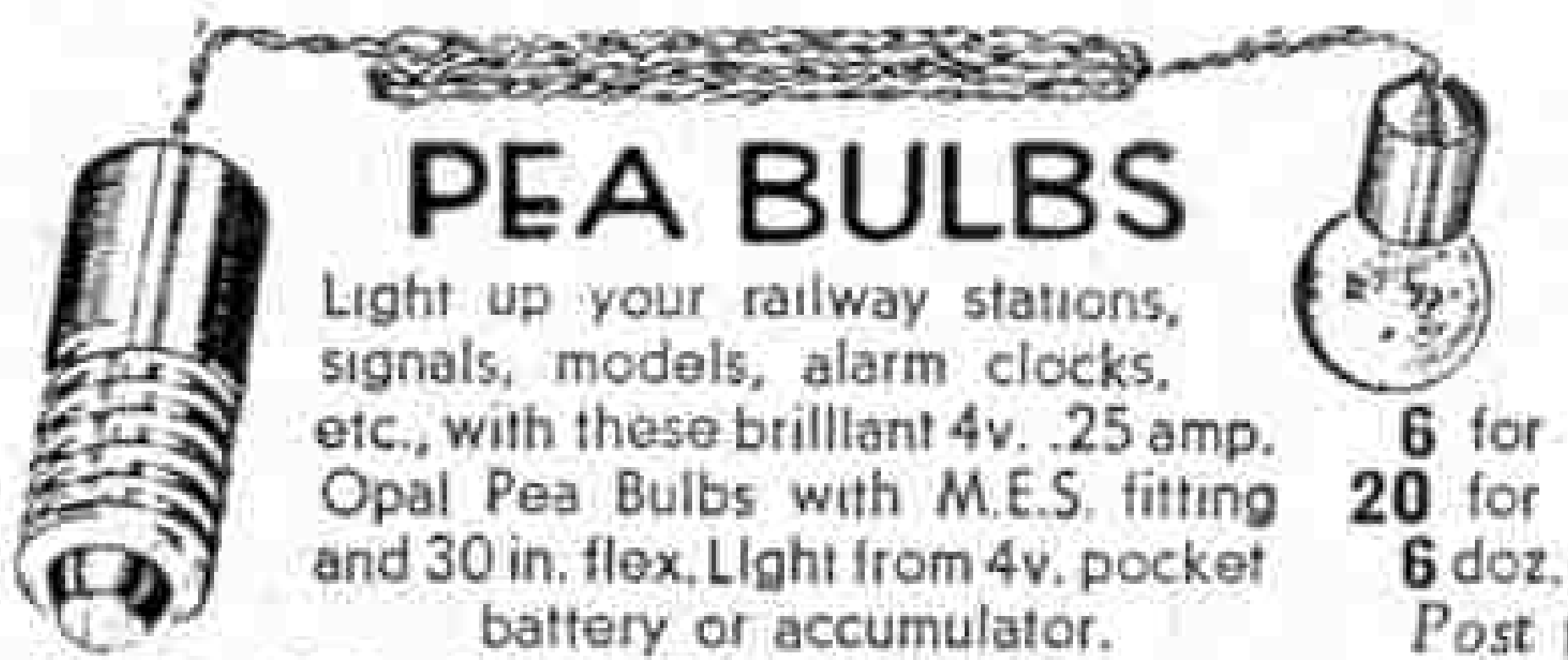

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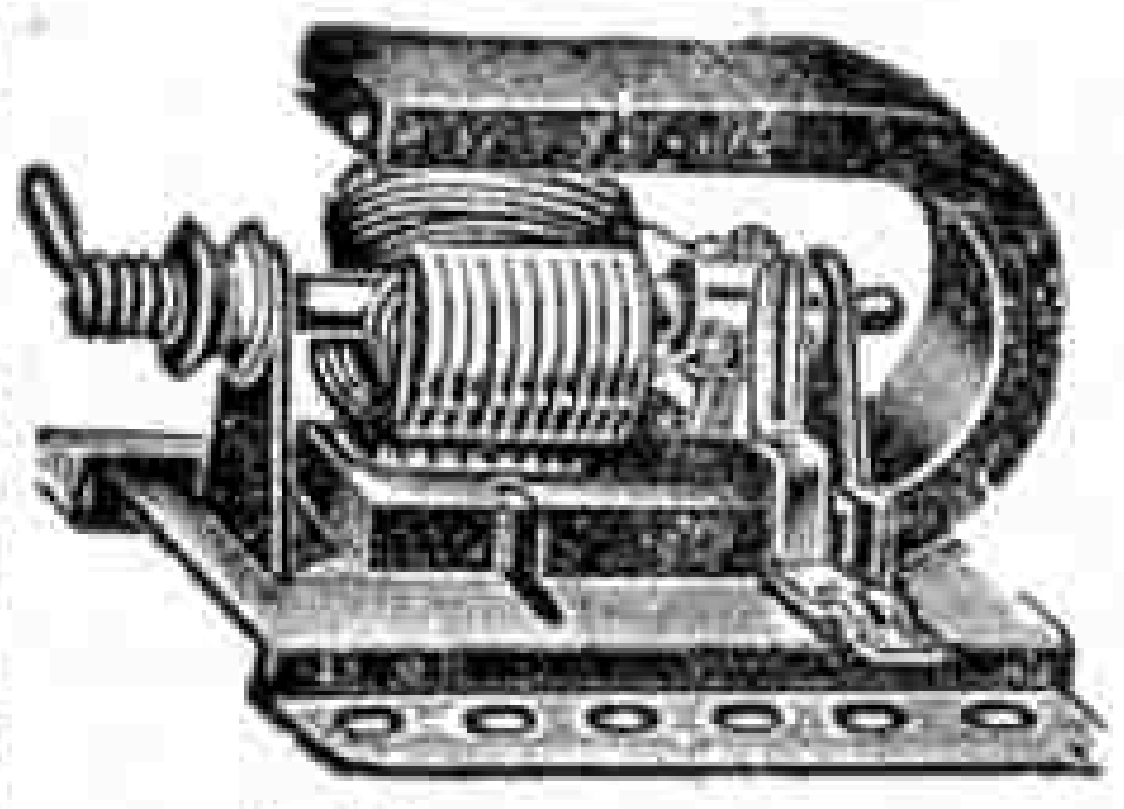

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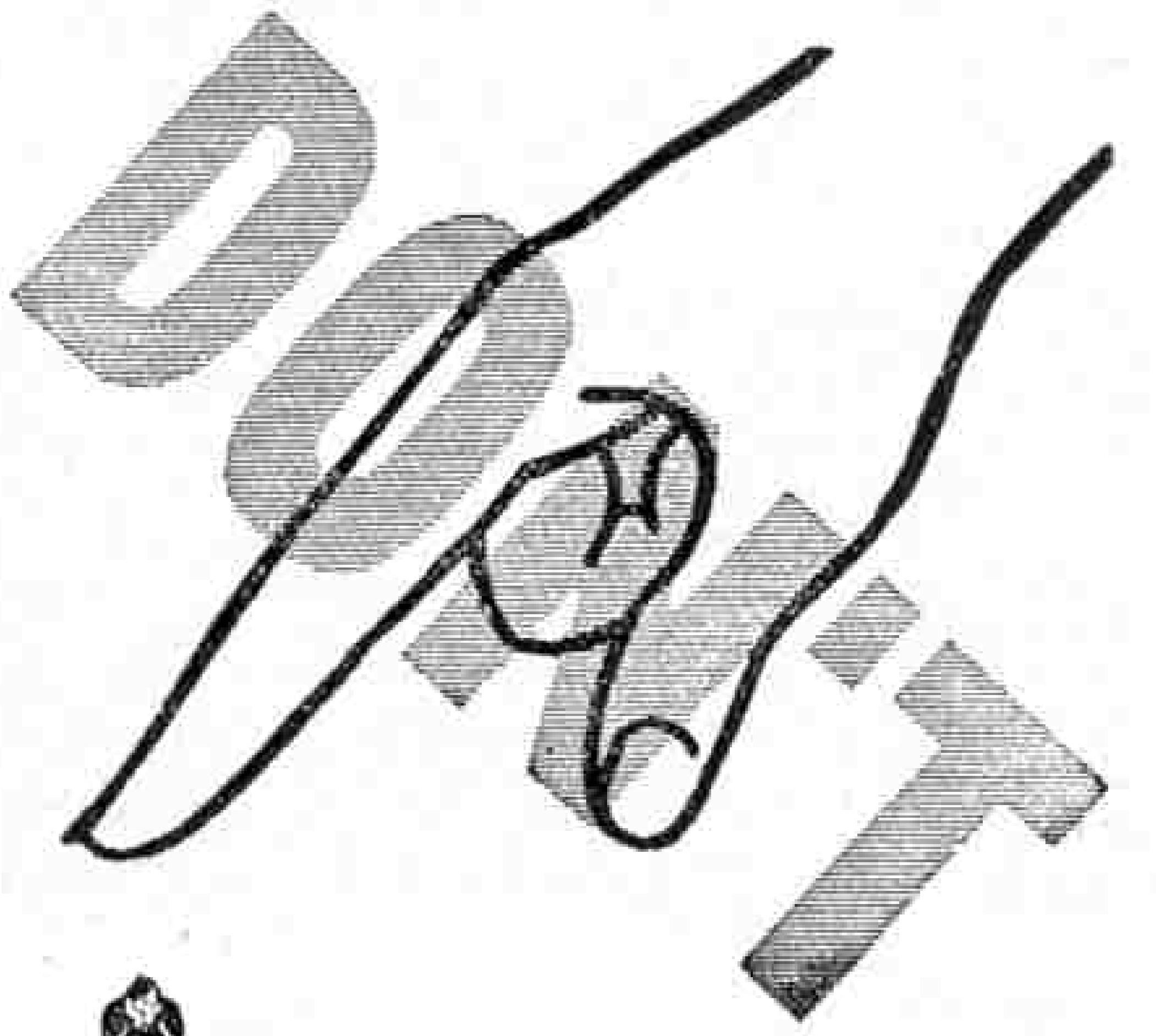

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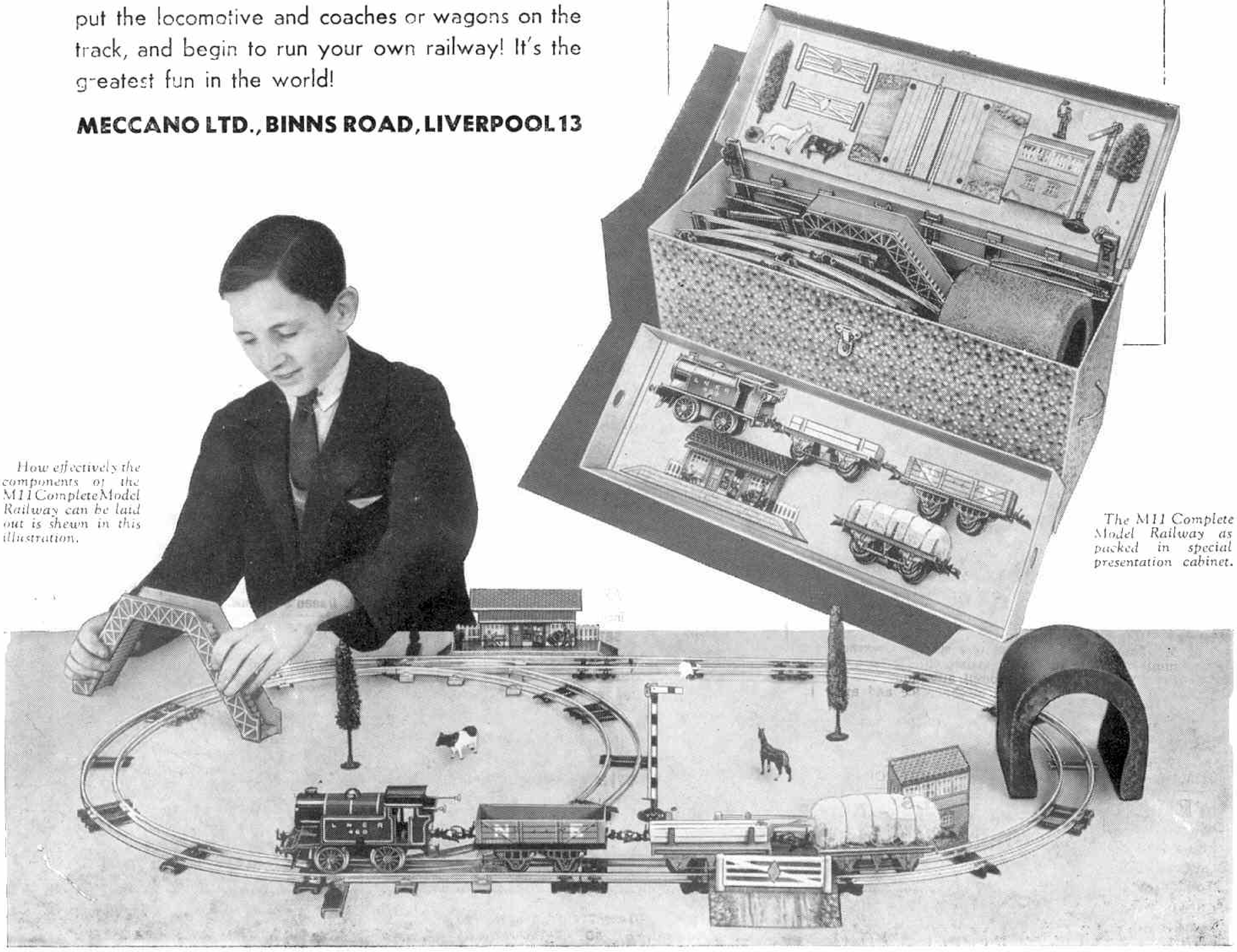

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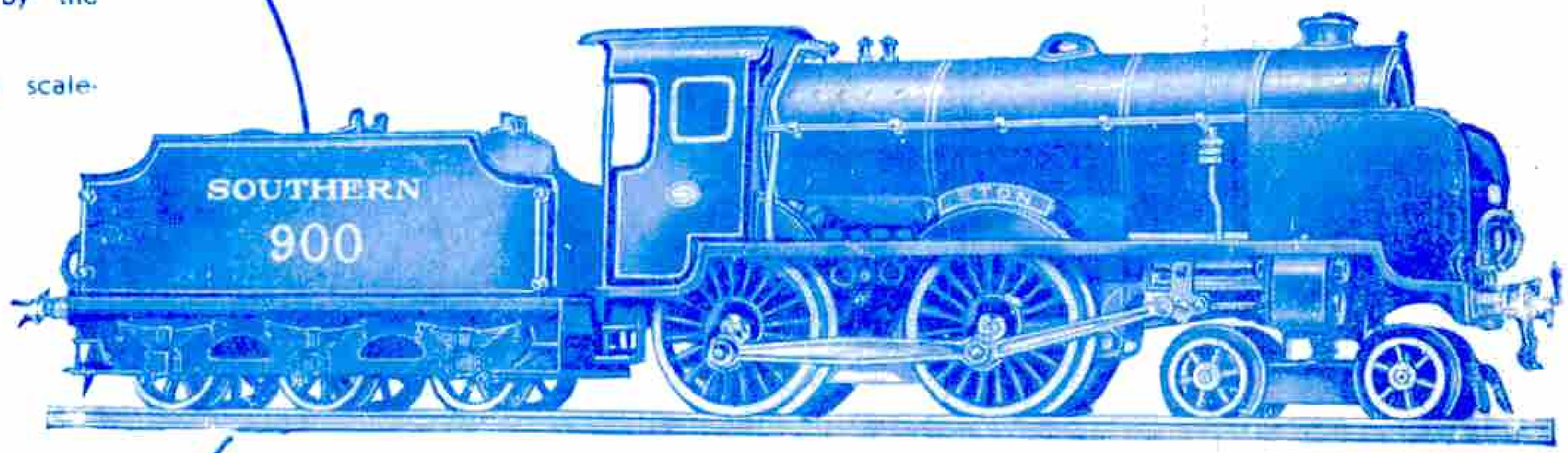

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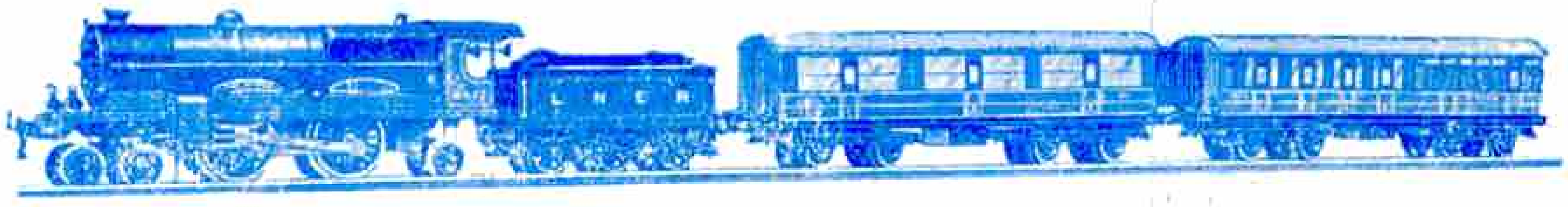

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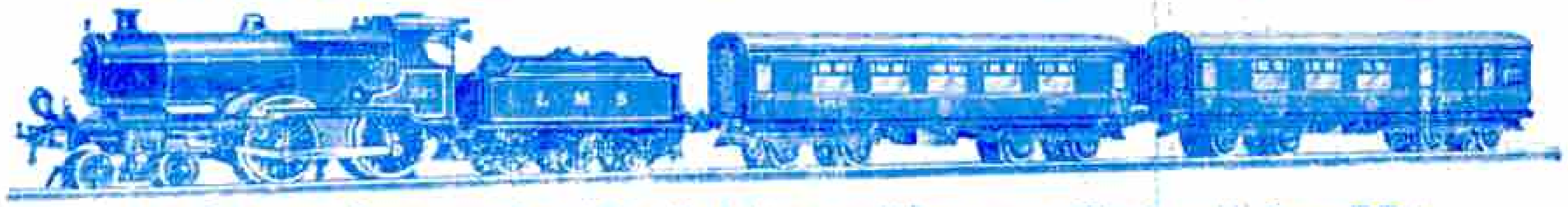

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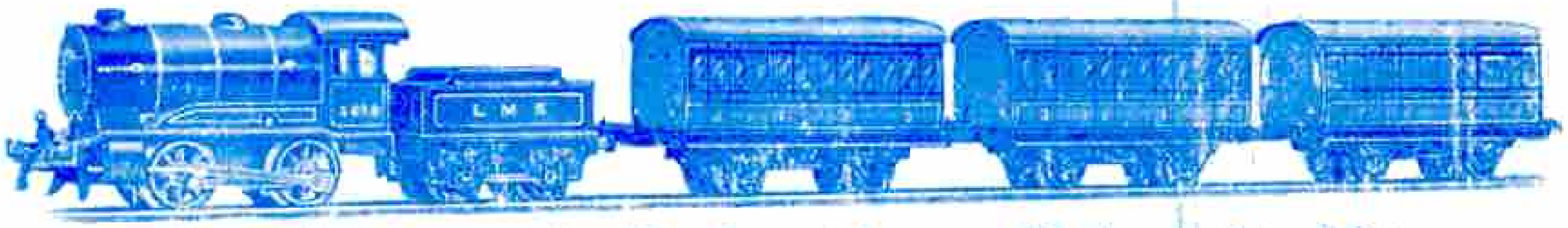
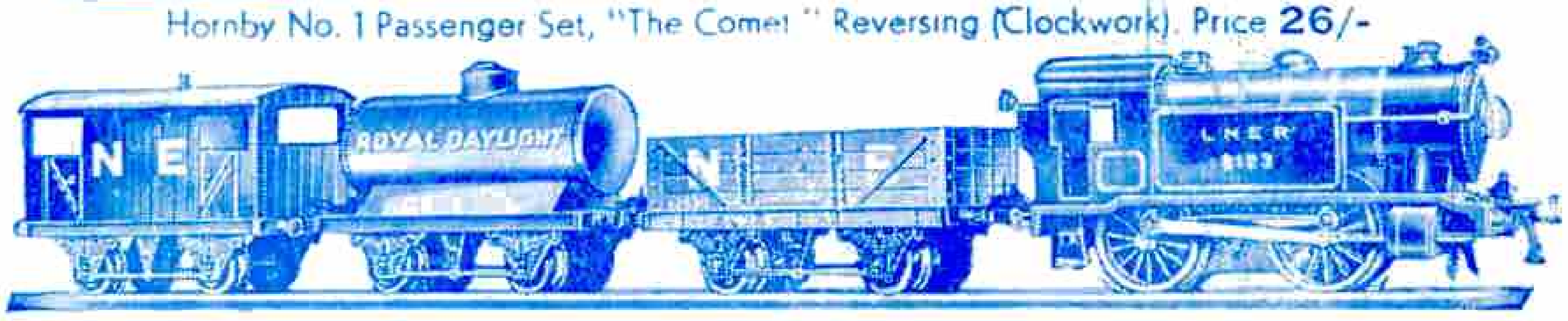


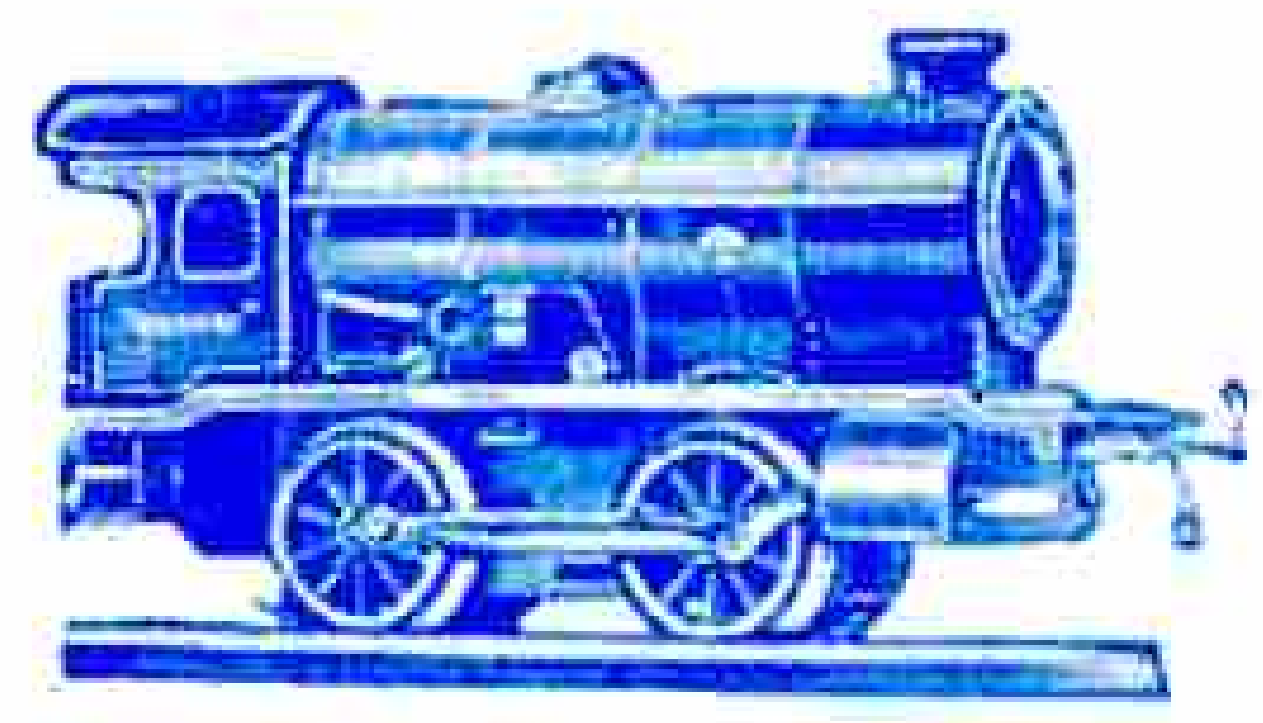
Hornby No. 1 Passenger Set, "The Comet." Reversing (Clockwork). Price **26/-**



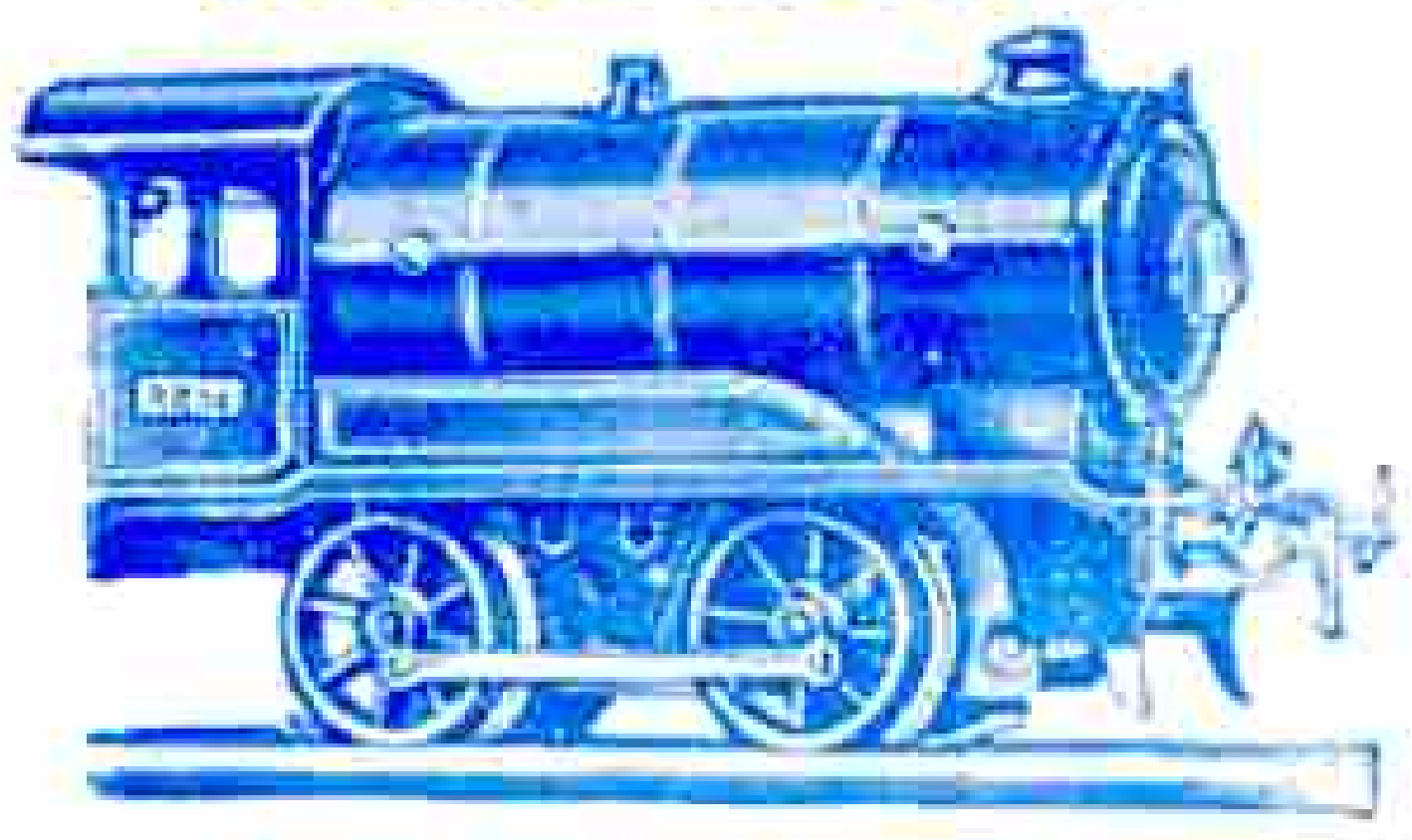
Hornby E120 Special Tank Goods Set. Automatic Reversing (20-volt Electric). Price **43/6**

A SELECTION FROM THE RANGE OF HORNBY LOCOMOTIVES

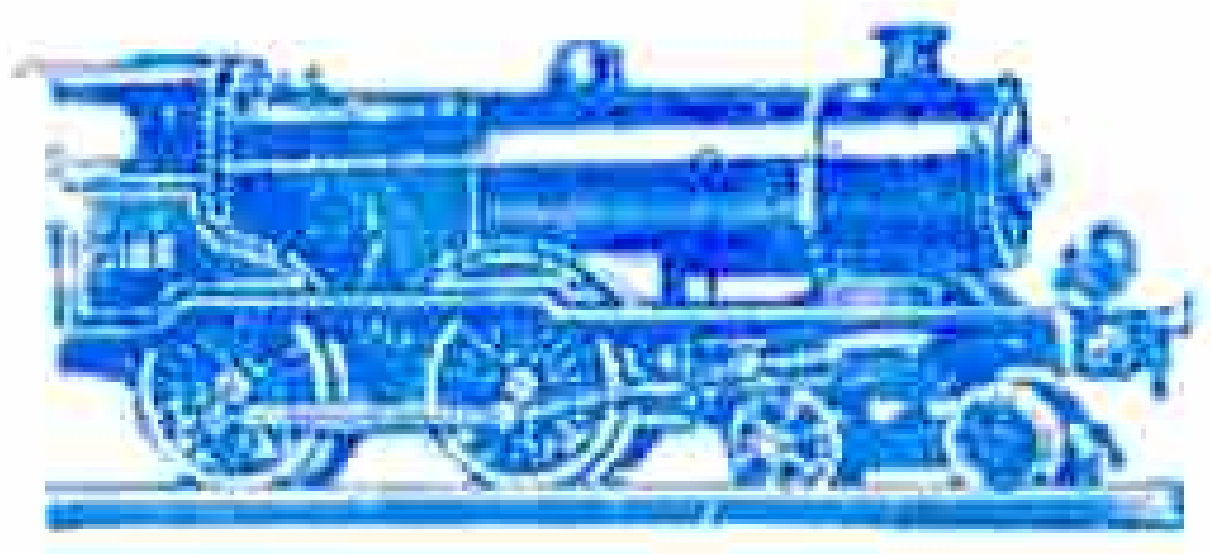
Electric Models



EM120 (20-volt) or EM16 (6-volt) ELECTRIC LOCOMOTIVE

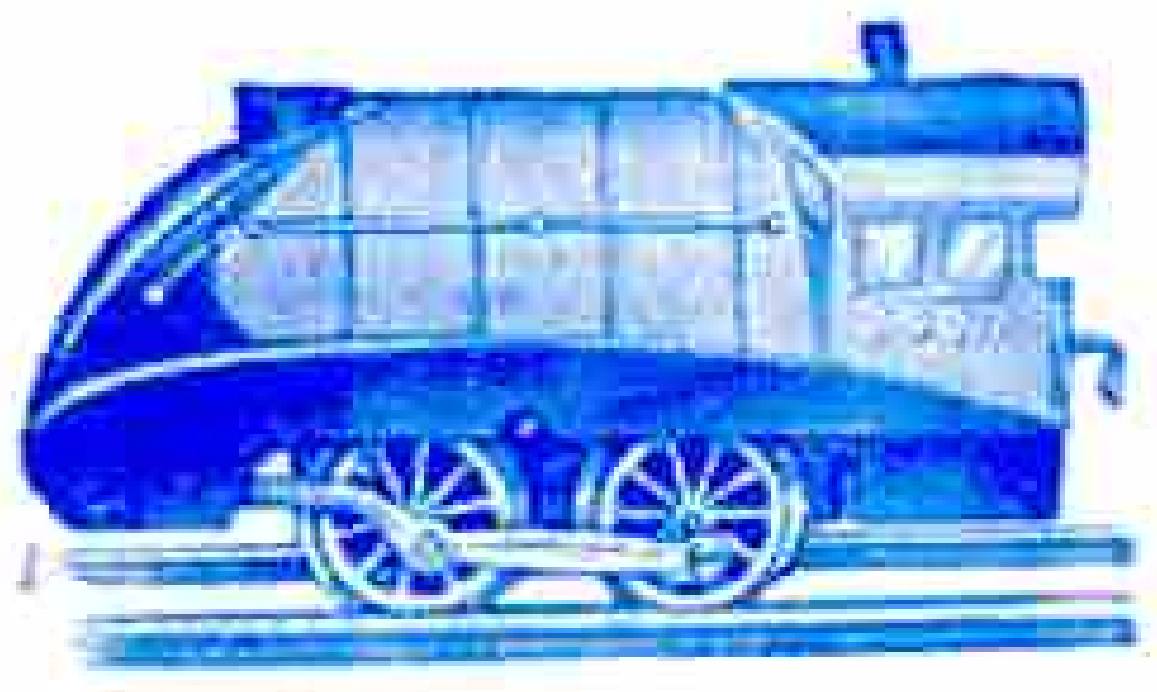


EO20 (20-volt) ELECTRIC LOCOMOTIVE

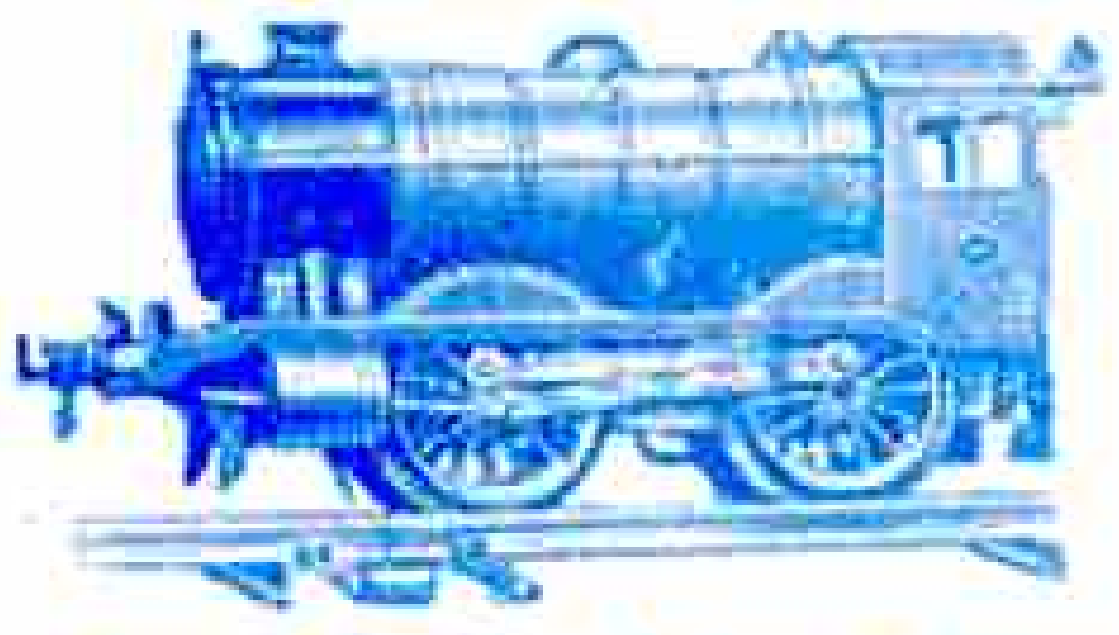


E220 (20-volt) SPECIAL ELECTRIC LOCOMOTIVE

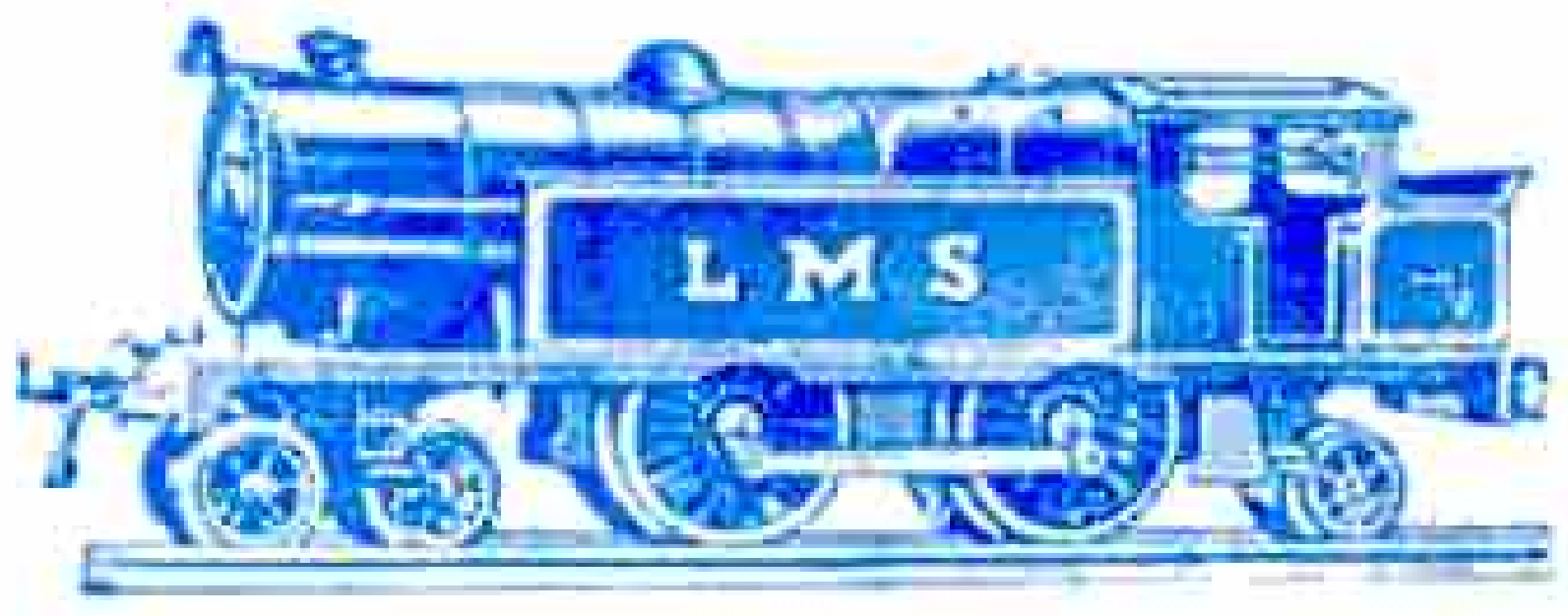
Clockwork Models



No. O "SILVER LINK" LOCOMOTIVE



No. 1 SPECIAL LOCOMOTIVE



No. 2 SPECIAL TANK LOCOMOTIVE

Electric Models

EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing). Price **8/6**

EO20 (20-volt) Locomotive (reversing). Price **19/-**

E220 (20-volt) Special Locomotive (automatic reversing). Price **38/6**

Clockwork Models

No. O "Silver Link" (non-reversing). Price **3/6**

No. 1 Special Locomotive (reversing). Price **17/6**

No. 2 Special Tank Locomotive (reversing). Price **21/-**

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